May 1953 Pages 137-180

The Journal *of the* SOCIETY OF DYERS AND COLOURISTS

Volume 69 Number 5

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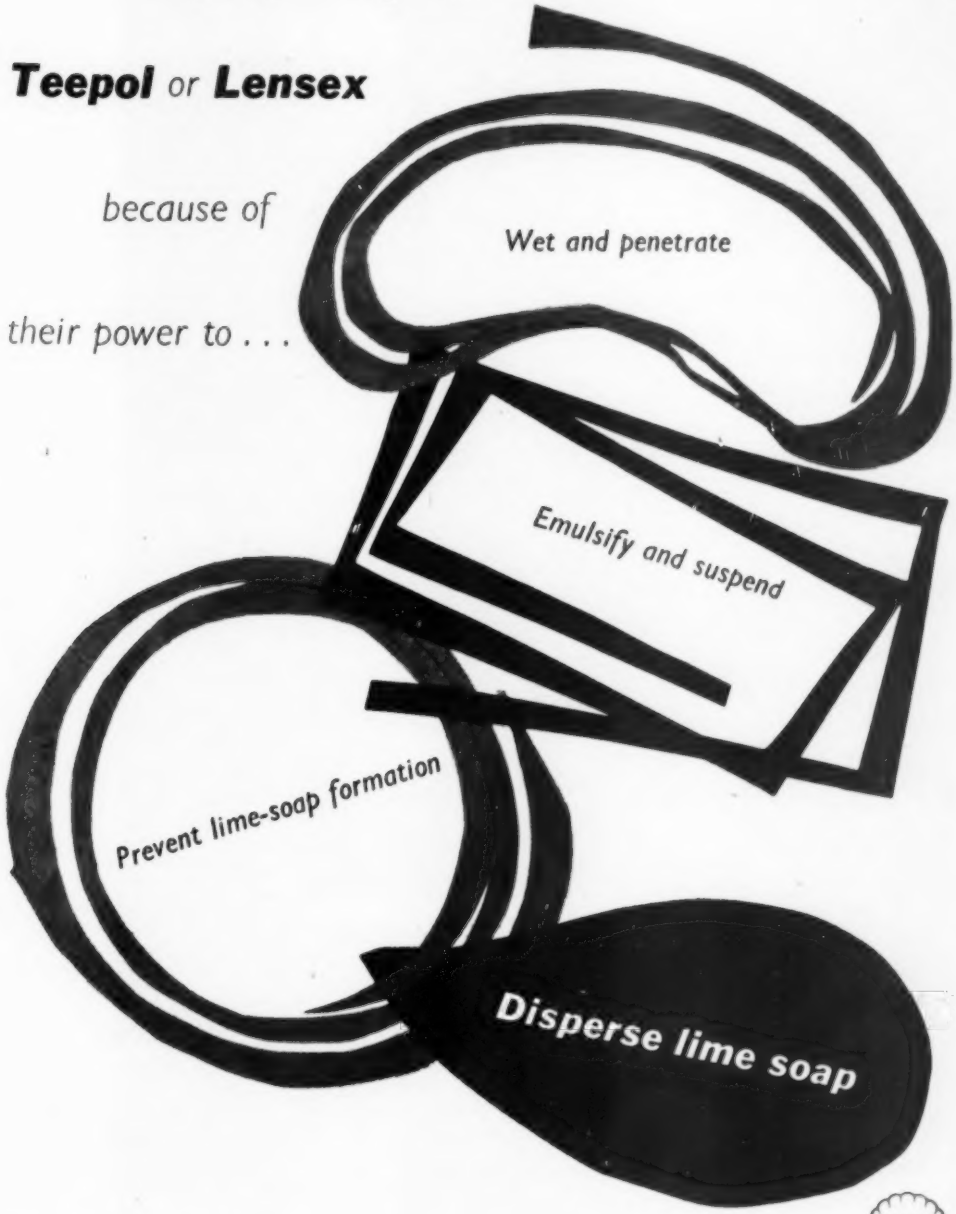

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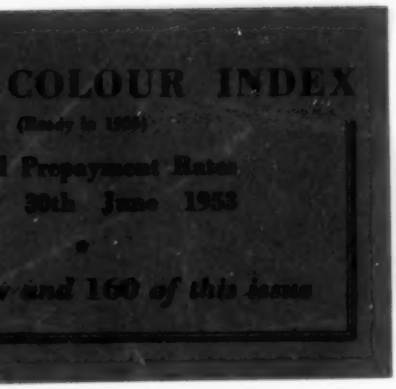
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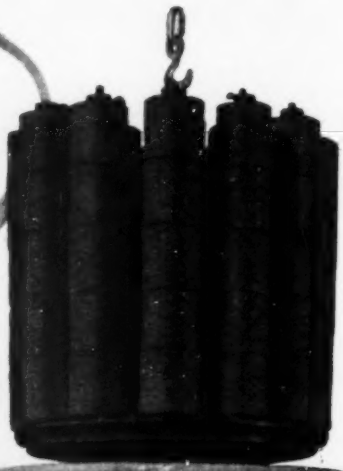

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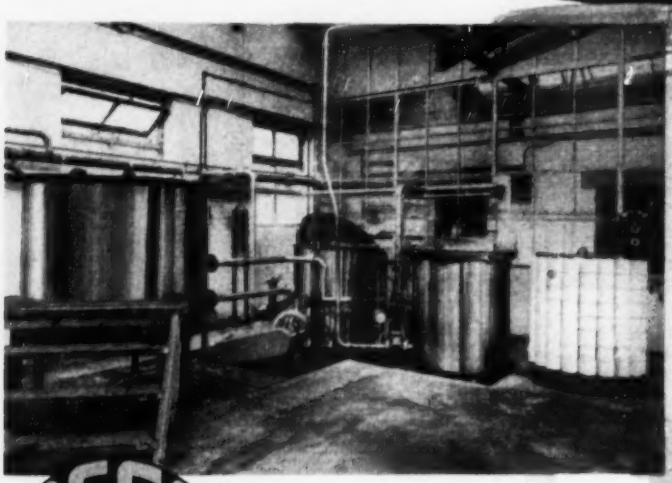

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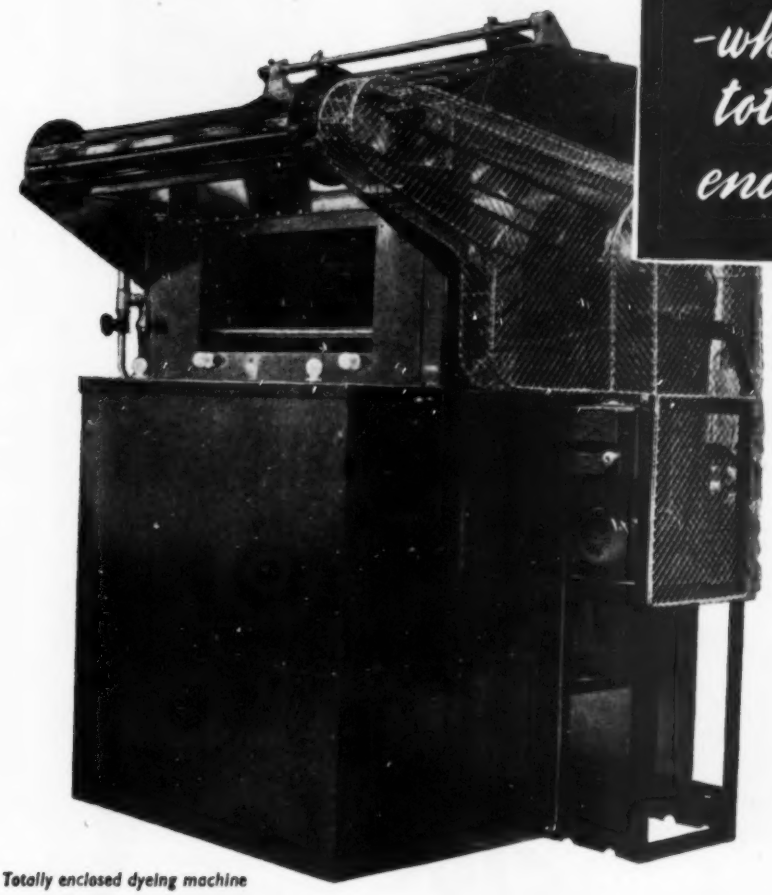

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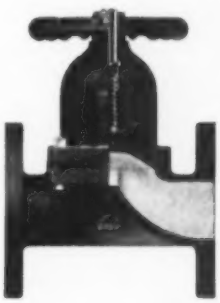

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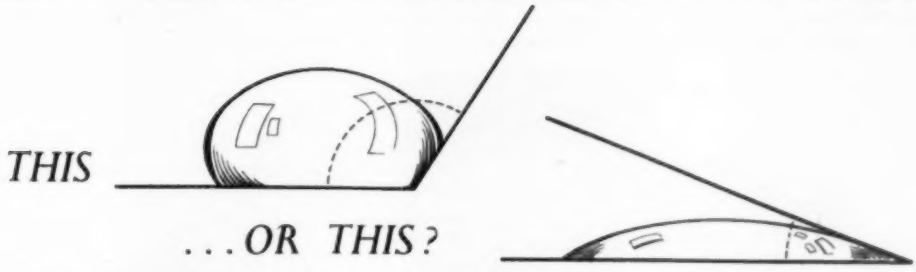

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Readers requiring *general information* regarding the Official Notices, List of Officers of the Society, etc. should consult pages 1–6 of the January 1953 and pages 237–240 of the July 1952 issues of the *Journal*, or write to *The General Secretary*, The Society of Dyers and Colourists, Dean House, 19 Piccadilly, Bradford, Yorkshire (*Telephone* Bradford 25138–9). *Editorial Communications* should be addressed to *The Editor*, at the same address.

Forthcoming Papers

The following papers have been accepted by the Publications Committee, and will appear in future issues of the *Journal*—

LECTURES

The Use of Hydrolysable Esters in the Control of Dyebaths
R. J. Hannay and W. H. Major

The Search for New Dyes in relation to Modern Developments in the Textile Field (George Douglas Lecture) *T. Holbro*

A Simple Microthermostat for Use in Colorimetric and other Optical Measurements *W. J. Marshall*

Fugitive Tinting with particular reference to Celafibre
H. C. Olpin and A. J. Wesson

The Effect of the Soaping Aftertreatment on Vat Dyes
F. Sumner, T. Vickerstaff, and E. Waters

The Structure and Chemical Properties of Dyes in relation to their Use *T. Vickerstaff*

COMMUNICATIONS

Polymerisation of a Series of Vinyl Monomers in Wool
N. K. Boardman and M. Lipson

Studies in the Fundamental Processes of Textile Printing.
V— The Transfer of Disperse and Water-soluble Dyes to Cellulose Acetate during Steaming

VI— The Transfer of Disperse and Water-soluble Dyes to Nylon during Steaming
E. H. Daruwalla and H. A. Turner

Further Observations on the Effects of Evaporating Water from Cotton Cellulose *G. W. Madaras and H. A. Turner*

Some Aspects of the Drying and Heating of Textiles.
VIII— Note on Modifications produced by Thermal Treatments of Acetate Fibres
J. M. Preston and M. V. Nimkar

The Use of Non-ionic Level-dyeing Assistants in Pre-chrome Complex Dyebaths *I. D. Rattee*

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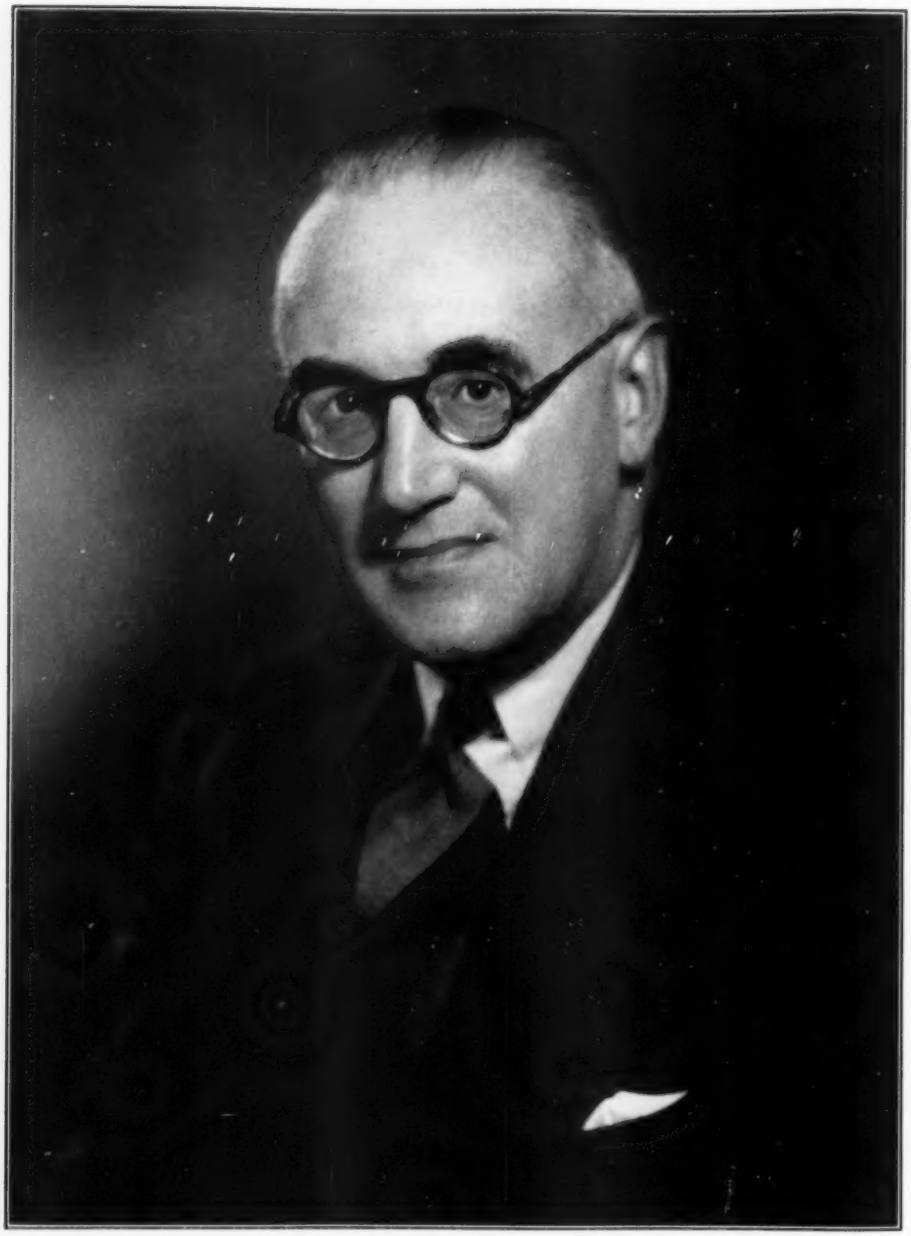

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Elected President of the Society of Dyers and Colourists 1953

THE JOURNAL

OF THE

Society of Dyers and Colourists

Volume 69 Number 5 MAY 1953 *Issued Monthly*

Proceedings of the Society

Annual General Meeting

The 69th Annual General Meeting of the Society of Dyers and Colourists was held at the May Fair Hotel, London W.1, on Friday, 10th April 1953, at 4.50 p.m., the President (Mr. H. H. Bowen) being in the chair, and about 50 members of the Society being present.

The General Secretary (Dr. C. J. W. Hooper) read the minutes of the 68th Annual General Meeting, which were accepted as a correct record.

REPORT OF THE COUNCIL

The activity of the Society has continued unabated during the year ended 31st December 1952, and it is particularly gratifying to be able to report a net increase in membership of approximately 50 in spite of the increased rates of membership subscription approved in November 1951.

The loss by death of thirteen members has been reported during the year, including Mr. F. Wilson, who had served on the Committee of the West Riding Section for twenty-four years.

It is very pleasant to record that four more members have now completed fifty years of membership of the Society, viz. Messrs. A. Baker, J. Heggie, F. W. Walker, and W. P. Walker.

Council is specially pleased to note that there are now three generations of one family (Messrs. J. R., R. J., and G. J. Hannay) having membership of the Society.

Mr. H. H. Bowen was elected President in March 1952, and as Chairman of Council has guided its deliberations to speedy and fruitful conclusions. Council is grateful to him for his sustained interest and extramural activities on behalf of the Society. It is greatly disappointed to learn that he is unable to accept nomination for a second year as President.

Council would like to take this opportunity of congratulating Mr. N. G. McCulloch on the award of the C.B.E., and Mr. W. von Bergen on that of the Olney Medal of the A.A.T.C.C. for 1952.

The activities of the Sections and Junior Branches have been maintained at a high level, and in addition to the usual social functions several Sections held film shows and lectures of a more popular character to which ladies were specially invited.

In the course of the year cordial greetings were exchanged with the President of the Society of Dyers and Colourists of Australia, and Council congratulated this affiliated Society on the inauguration of a Queensland Section in Brisbane during August 1952, in addition to the three existing Sections of Victoria, New South Wales, and South Australia.

A close relationship with the Textile Institute has been maintained, notably in the production of the *Reviews of Textile Progress*, the sales of Volume 3 of which, published in the early part of December 1952, have already been most gratifying. Relations with other similar societies remain cordial, and co-operation continues locally in the production of joint syllabuses and the holding of joint meetings.

The Annual Convention of the American Association of Textile Chemists and Colorists, held in Boston, Massachusetts, in November 1952, was attended by Dr. P. W. Cunliffe, Mr. K. McLaren, and Mr. E. Wilson, the Society's official representatives at the I.S.O. meetings held the following week in New York, and at the banquet Dr. Cunliffe presented on behalf of the Society a specially bound volume of *The Tinctorial Arts To-day*. All three representatives of the Society were warmly received.

The Annual Congress of the Association des Chimistes de l'Industrie Textile, held in Toulouse in September 1952, was attended by Mr. D. P. Raper, Mr. E. A. Swift, and Dr. T. Vickerstaff, who reported that the Conference was most successful, in respect of both its scientific and its social activities. Dr. C. S. Whewell conveyed the formal greetings of the President and Council to the Third Canadian Textile Seminar, held by the Textile Technical Federation of Canada in Kingston, Ontario, in September 1952; this expression of goodwill from England was greatly appreciated by the gathering.

Early in the year an invitation was received for the Society to join the revived International

Federation of Associations of Textile Chemists and Colourists, which comprises the leading Continental societies of this character. After full consideration of the issues involved, Council decided not to adhere to the Federation, but wishes it every success.

Finance Committee— This Committee has met nine times during the year. It is very gratifying that the increased rates of subscription have led neither to a falling off in membership nor to a decrease in the number of subscribers to the *Journal*. Early in the year a scheme was worked out to lessen the hardship caused in the cases of younger and older members of the Society. This was approved at the Annual General Meeting in 1952, and is now operating smoothly.

Alterations to and decoration of the new General Offices of the Society at 19 Piccadilly were completed soon after removal, and the Society is now operating normally.

The attention of the Committee has been largely occupied during the year with several matters relating to the Second Edition of the *Colour Index*. The importation of the paper from the U.S.A. has involved a heavy outlay for customs duty and also a heavy liability for half the cost of the paper itself, to be set against payment which will be due from the A.A.T.C.C. for printing costs.

The Committee has prepared a preliminary scheme for the financing of the new *Colour Index* based on a prepayments scheme, and it is hoped that a definite announcement will be made shortly. The response to this scheme will determine what other steps will be necessary to cover the very heavy material outlay in respect of the production of the new *Colour Index*, and it is realised that for some two or three years the finances of the Society will be severely strained.

Council wishes to record its gratitude to the Dyers and Finishers' Association for the gift of an annual sum of £10 as prize money for competition between junior members of the West Riding Section.

Council is grateful to the advertisers for their continued support of the *Journal*.

Diploma Committee— A new Committee has been set up by Council, and is actively engaged on the preparation of a detailed scheme.

New Bye-laws— A new draft set of Bye-laws was formally approved at the A.G.M. in 1952, and now govern the working of the Society. Perhaps the most outstanding change will be apparent in the Vice-presidential election in 1953, when there will be only one vacancy to be filled.

Publications Committee— This Committee meets monthly, and in addition its members devote many hours to the reading of proofs, thus ensuring a high standard in the *Journal*. Publication of lectures and communications on a wide variety of subjects has continued, their number and length being similar to the previous year when it is remembered that the December 1951 issue consisted of the papers given at the Harrogate Conference. On several occasions the text portion of the *Journal* has been brightened by the inclusion of reproductions in colour, and the Committee is grateful to the firms who have been good enough to lend the colour blocks.

Council wishes again to record its gratitude to all who have contributed to the production of the *Journal*, especially the authors of papers, referees, abstractors, Mr. C. O. Clark as Editor of the Abstracts of Patents, and Mrs. E. G. Thomson, whose compilation of the Index enabled it to be distributed with the February issue of the *Journal*.

The third impression of the photolithographic reproduction of the *Colour Index* and *Supplement*, the second impression of the second edition of *The Identification of Dyes on Textile Fibres* by Ellis Clayton, and the second edition of *The Theory and Practice of Wool Dyeing* by C. L. Bird have met with a steady sale during the year.

Colour Index, Second Edition— The members of the *Colour Index* Editorial Panel have been most active during the year, which has seen the virtual completion of information from dyemakers. It is now possible to obtain a clear idea of the amount of material to be handled and what form it will take. Typical layouts have been prepared from factual material, and there has been the closest co-operation with the printers, Messrs. Chorley & Pickersgill Ltd. and Messrs. Lund Humphries & Co. Ltd. Both firms have been extremely helpful and have made many valuable suggestions. A production schedule has been agreed with the American Association of Textile Chemists and Colorists which provides for the printing to be done during 1953 and 1954 with publication in 1955. The aim will be to publish early in 1955, but it is not possible at this date to be certain of this, and the Panel will have a difficult task in meeting this schedule.

As already mentioned under Finance, plans have been considered for the financing of the work, and details of the prepublication subscription plan should be issued shortly.

Close and cordial liaison with the *Colour Index* Steering Committee of the A.A.T.C.C. has been maintained during the year, and it is a pleasure to record our appreciation of the work of Mr. W. H. Cady, Chairman and Co-ordinator to the A.A.T.C.C. committees, who has completed his work on the editing of the U.S.A. dye manufacturers' reports into a uniform pattern.

Early this year 62 tons of paper was received from the A.A.T.C.C. for the printing of the *Colour Index* and this was purchased at a satisfactory price even when allowance is made for the subsequent fall in paper prices in this country.

The work of the Panel, which for some years has been extensive, will during the next two years be very onerous, and Council records its indebtedness to members for their mutual endeavours and wishes them well in the completion of this task, which will be a landmark in the affairs of the Society. Council also wishes to thank the firms and institutions who have permitted and encouraged members of the Panel to take part in this

work, and records its appreciation of the willing co-operation of dye manufacturers.

SOCIETY'S MEDALS ADJUDICATION COMMITTEE— Council has approved the Committee's recommendation that no award be made for 1952.

LIBRARY— The Society has now collected some 200 books and runs of 60 periodicals since 1948, in some cases longer, a list of which has been sent out to members with the January 1953 issue of the *Journal*. Council has accepted the recommendation of the Publications Committee that the formation of a library is desirable, to be based on books sent for review in the *Journal*, and has allocated a small sum for the purchase of books relating to dyes and their uses.

WORSHIPFUL COMPANY OF DYERS' RESEARCH MEDAL— Council thanks the Adjudication Committee for its work in reviewing papers published in the *Journal* from July 1951 to June 1952, as a result of which the Court of the Worshipful Company of Dyers has approved the recommendation that the Company's Gold Medal be awarded to Mr. H. Hampson for his work on the vat dyeing of viscose rayon cakes (the citation in respect of the Medal appears in the January 1953 issue, p. 5).

WORSHIPFUL COMPANY OF FELTMAKERS' RESEARCH MEDAL— Council and the Adjudication Committee have to report with great regret that no paper in this field has been published in the *Journal* during the period under review.

GEORGE DOUGLAS LECTURE— The second George Douglas lecture, on *Synthetic Fibres in Prospect and Retrospect*, was delivered by Dr. Rowland Hill in Manchester on 7th March 1952, the chair being taken by the then President, Mr. F. Scholefield. The lecture was subsequently published in the May issue of the *Journal*, and constitutes a valuable survey of the field.

Arrangements have been made for the third George Douglas lecture to be given by Dr. T. Holbro, of Basle, Switzerland, on *The Search for New Dyes in relation to Modern Developments in the Textile Field*, at the University of Leeds, on Friday, 27th March 1953.

MERCER LECTURE— The ninth Mercer Lecture, on *Non-felting Wool and Wool Mixtures*, was delivered by Dr. F. C. Wood in Leicester on 9th May 1952, the chair being taken by the President. This valuable review of non-felting processes was subsequently published in the December issue of the *Journal*.

The tenth Mercer Lecture is to be given at the Royal Institution, London, on Thursday, 9th April 1953, when Messrs. J. R. Blockey and D. H. Tuck will review *The Coloration of Leather*.

ANNUAL DINNER— The sixty-eighth Annual Dinner was held at the Queens Hotel, Leeds, on 28th March 1952, when there was a record attendance of about 370. The principal guest was Mr. N. G. McCulloch, who gave an interesting address on the scientific examination of problems of management. Sir George W. Martin, Master of the Worshipful Company of Feltmakers, replied to the toast of "Our Guests", proposed by Mr. G. S. J. White. The Gold Medal of the Society was presented to Mr. W. Kilby by the President.

SUMMER SCHOOL IN LOUGHBOROUGH— The third Summer School sponsored by the Society was held on 23rd–30th August 1952 in conjunction with the Summer School of Loughborough College, the general theme being "Background to the Industry". Sixty students attended, 54 of them residential in the Dower House and Soar House Hostels and including visitors from Norway, Holland, Australia, Italy, and Belgium. The School was opened on the Saturday, 23rd August, by the President at an informal dinner. Ten lectures were given during the mornings on Monday to Friday, and in the afternoons there was laboratory work and nine works visits. The School closed with an address by Mr. F. L. Goodall on *The Place of the Technologist in our Industry* (printed in the January 1953 issue of the *Journal*), the President occupying the chair.

Council is convinced that functions of this character form an important part of the Society's activities, as they interpret the latest results and techniques of science to those actually engaged in day-to-day production in industry, and thus form an important link in the economic application of existing scientific knowledge which is so needed in the country at this time.

Council wishes to record its appreciation of the co-operation of the authorities of Loughborough College in the organisation of the School and in placing their recreational amenities at the disposal of students, and its gratitude to all who worked so hard to ensure the smooth running of the School. It is especially grateful for the work of members of the Midlands Section, and wishes to congratulate the Section on the success of the first Summer School to be held by the Society in that area.

TEXTILE PRINTING SYMPOSIUM— Arrangements are now well advanced for a Symposium on Textile Printing to be held at the Hotel Majestic, St. Annes-on-Sea, on Wednesday to Friday, 23rd–25th September 1953, firm promises having been received for some fifteen papers. Council is grateful to the organising committee for the work it has already done, and is confident that the Symposium will be as great a success as those previously run by the Society.

FASTNESS TESTS CO-ORDINATING COMMITTEE— Considerable activity has been displayed by the F.T.C.C. and its technical subcommittees, the former having held eight meetings during the year.

In accordance with its policy of publicising the results of its investigations, the F.T.C.C. has sponsored the publication of five papers in the *Journal*. These have dealt with light tests, grey scales, and perspiration.

Particular mention may be made of the labours of the Light Fastness Subcommittee, which has devoted much time to the revision of *B.S.*1006. The text of this specification has also been used with small modifications as an international draft standard.

The Perspiration Fastness Subcommittee has made a thorough study of natural perspiration and the synthetic liquors so far proposed. It has found a constituent of natural perspiration, not hitherto used in the synthetic solutions, which is responsible for certain colour changes, and it is now proceeding to devise a more satisfactory laboratory test based on these findings.

The main committee has been responsible for the development of the two grey scales, and it is satisfactory to note that a Grey Scale for Assessing the Effect on the Pattern has now been produced in bulk quantities and is available for general use.

Our relations with the fastness tests committees of other countries have been cordial and continuous. Observers attended a meeting of the Continental Group in Paris in April 1952. At this meeting a Continental organisation, known as E.C.E., was formed to co-ordinate the work on the European Continent. By invitation Dr. Cunliffe (Chairman of the F.T.C.C.) subsequently attended a meeting of the working committee of the E.C.E. in Basle in September 1952.

The Society was represented by three members (Dr. P. W. Cunliffe, Mr. K. McLaren, and Mr. E. Wilson) at the meetings of the International Standards Organisation, Colour Fastness Subcommittee ISO/TC 38/SC 1 held in New York in November 1952, at which appreciable progress was made towards the acceptance of international test methods and standards. The Society is especially grateful to the firms employing these members for facilitating their attendance at these very important meetings.

Dyeing Affinity of Regenerated Cellulose — The Committee has held one meeting during the year. Results indicate that an accurate method could be recommended, but, as it depended on a specific type of dyeing instrument, optical instrument, and filters, it was felt that the method would not be generally useful. The Committee is seeking a commercial dye with a minimum of impurity having a minimum influence on any chosen colour filter.

Preservation of Historical Records— Several gifts of publications have been received during the year, for which the Society records its gratitude. Lectures have been given describing the work of the Committee, at which interesting historical books in the Society's possession were exhibited, stress being laid on the importance of preserving both old documents of historical interest and modern documents which are likely to acquire such interest in the future.

Terms and Definitions Committee— The Committee has met four times during the year. It has approved publications of thirteen tentative definitions and considered criticisms of tentative definitions already published in the *Journal*. A statement of the principles guiding its work has been published, and the Committee emphasises that it welcomes criticisms of its definitions. In the course of the year Mr. N. Hamer resigned as Chairman of the Committee but is still a member, and has been succeeded by Dr. T. Vickerstaff.

Moth and Dermestid Beetle Proofing Committee— The results of interlaboratory larval tests carried out by three European and four English laboratories were discussed at a meeting held in Paris in January 1952 and subsequently examined statistically. The results obtained were inconclusive in so much as they did not show any decided advantage for one particular method and further they showed substantial variation between the laboratories.

Later in the year the English laboratories suggested a modified method of test, which will be the basis of further tests in 1953.

Representatives on External Bodies— The Council is grateful to members who have represented the Society on the external bodies listed on p. 239 of the July 1952 issue of the *Journal*, and wishes to thank them for their annual reports on the activities of these bodies.

Council regrets that it has to record that Mr. R. Conchar of Messrs. John Conchar & Co. feels unable to continue acting as Honorary Solicitor, but fully appreciates the reasons which have compelled him to arrive at this decision. It wishes to take this opportunity of paying tribute to Mr. Conchar's long record of willing service to the Society over many years. Council wishes also to thank Mr. L. E. Jones for acting as Honorary Patent Agent.

Council records its appreciation of the various donations which have been received during the year.

This report cannot give a complete account of the Society's activities during the past year, and a more complete picture of these may be obtained from a perusal of the *Journal*.

In conclusion, the gratitude of Council must be expressed to all members who have served the Society in an honorary capacity, and in thanking them as individuals Council would also thank the firms and institutions who make it possible for them to serve the Society as they do.

Finally, Council wishes to record its appreciation of the services of the salaried officers and members of the office staff, who have had an unusually difficult year owing to the dislocation arising from the removal to the new offices.

The Honorary Secretary (Mr. J. Barritt), in moving the adoption of the Annual Report, which had been in members' hands during the past six weeks, said that the Society was in good shape, and that the various committees had worked hard during the year. The new scheme for membership subscriptions had worked smoothly and membership had been maintained.

The Summer School had been an unqualified success, which reflected great credit on the Midlands Section. The continued vigorous activity of the Sections was an indication of the underlying strength of the Society, and he would like to mention especially the recent first London Lecture, which had been an outstanding success and must help the Society in that area. The President and he had attended also the A.G.M. and Dinner of the Northern Ireland Section, and had found a wonderfully enthusiastic body of members in the youngest Section of the Society.

Balance Sheet as at 31st December 1952

31.12.1951	SURPLUS AND LIABILITIES	£ s. d.	£ s. d.
	SURPLUS AND DEVELOPMENT		
	Balance of Accumulated Funds	30,334 0 9½	
	Less Accumulated Expenditure on *Colour Index* (2nd edition)	6,395 9 0½	
22,348		23,938 11 9	
1,850	FOUNDATION FUND	1,850 13 0	
100	KNECHT MEMORIAL FUND	100 0 0	
2,000	GEORGE DOUGLAS LECTURE FUND	2,000 0 0	
	AMOUNTS RECEIVED IN ADVANCE		
2,111	Subscriptions	1,844 16 6	
	CURRENT LIABILITIES		
3,169	Sundry Creditors and Amounts accrued per Schedule	6,436 15 10	
	COLOUR INDEX (2nd EDITION)		
	NOTE—At the date of the Balance Sheet there exists a liability in respect of a proportion of expenditure incurred by the American Association of Textile Chemists and Colorists, of which one-half is payable by the Society and which is not ascertainable at the date of this Balance Sheet.		
£31,578		£36,170 17 1	£36,170 17 1

31.12.1951	ASSETS	£ s. d.	£ s. d.
	DEVELOPMENT ACCOUNT INVESTMENTS AT COST		
19,383	(Market Value £17,427)		20,044 13 1
	FOUNDATION FUND INVESTMENTS AT COST		
1,850	(Market Value £1,840)		1,850 13 0
	KNECHT MEMORIAL FUND INVESTMENTS AT COST		
100	(Market Value £79)		100 0 0
	GEORGE DOUGLAS LECTURE FUND		
2,000	INVESTMENTS AT COST ... ... (Market Value £1,523)		2,000 0 0
	CURRENT ASSETS		
42	Cash in Hand	90 19 4	
512	Cash in Bank	289 18 0	
	Debtors and Prepayments per		
4,004	Schedule	3,620 1 5	
3,147	Stocks per Schedule	7,648 16 0	
7,705			11,649 14 9
	FIXED ASSETS		
	Furniture and Equipment		
65	Library	62 2 6	
379	General	366 11 5	
96	*Colour Index* (2nd edition) ...	97 2 4	
540			525 16 3
£31,578			£36,170 17 1

H. JENNISON, *Honorary Treasurer*
JOHN BARRITT, *Honorary Secretary*

AUDITORS' REPORT

We have examined the above Balance Sheet with the Books and Documents of the Society produced to us. In our opinion the above Balance Sheet is properly drawn up so as to exhibit a true and correct view of the state of the Society's affairs according to the best of our information and explanations given to us and as shown by the Books of the Society.

RAWLINSON, GREAVES & MITCHELL
Chartered Accountants
Auditors

20th February 1953
Bradford

COLOUR INDEX (SECOND EDITION) ACCOUNT

31.12.1951		£ s. d.	£ s. d.
	Total Expenses—		
210	Wages and National Health Insurance	243 5 11	
155	Printing, Stationery and Postages	235 18 3½	
52	Teas, Lunches and Travelling		
124	Conference Expenses ...		
40	Telephone	32 0 0	
11	Electricity and Heating ...	9 0 0	
9	Sundries	6 0 0	
41	Rent, Rates and Insurance ...	50 0 0	
11	Depreciation		
	Legal Charges	9 0 4	
	Audit and Accountancy ...	21 0 0	
	Customs Duty on Paper from America	1,785 8 9	
	Insurance on Paper ...	4 4 6	
	Freight and Carriage Charges on paper from port to warehouse	258 3 9	
	Cost of Paper and Shipping charges, etc. to U.K.—half		
653	cost charged to S.D.C.	4,668 10 0	7,322 11 6½
£653			£7,322 11 6½

31.12.1951		£ s. d.
	Stock of Paper, 31.12.52	4,668 10 0
653	Balance carried to *Colour Index* Accumulations Account	2,654 1 6½
£653		£7,322 11 6½

COLOUR INDEX (SECOND EDITION) ACCUMULATIONS ACCOUNT

31.12.1951		£ s. d.
653	Balance brought down	2,654 1 6½
3,616	Balance per Accumulations and Appropriations Account 31.12.51	4,269 0 8½
£4,269		£6,923 2 3

31.12.1951		£ s. d.
	Transfer to Consolidated General Revenue Account—	
	Expenses incurred in previous years but not allowable per agreement with AATCC ...	527 13 2½
4,269	Balance per Accumulations and Appropriations Account 31.12.52	6,395 9 0½
£4,269		£6,923 2 3

GEORGE DOUGLAS ACCUMULATION FUND ACCOUNT

31.12.1951		£ s. d.
	Lecture Expenses	52 9 2
	Bank Charges	2 0 0
146	Balance per Accumulations and Appropriations Account 31.12.52	150 16 5
£146		£205 5 7

31.12.1951		£ s. d.
86	Balance per Accumulations and Appropriations Account, 31.12.51	145 15 5
	Investment Income—	
60	3% British Transport 1978/88	59 10 2
£146		£205 5 7

CONSOLIDATED GENERAL REVENUE ACCOUNT FOR THE YEAR ENDING 31ST DECEMBER 1952

31.12.1951	EXPENDITURE	£ s. d.	£ s. d.	31.12.1951	INCOME	£ s. d.	£ s. d.
	To GENERAL OFFICE				By SUBSCRIPTIONS		
490	Printing and Stationery ...	514 13 1		4,788	Members	6,742 15 6	
156	Postages	189 0 7		63	Juniors	81 12 3	
1,545	Salaries, Wages and Superannuation ...	1,758 9 8		4,851			6,824 7 9
163	Rent, Rates and Insurance	278 4 1					
43	Electricity and Heating ...	36 8 3					
66	Telephone	52 18 1					
20	Bank Charges	21 8 0					
63	Audit and Accountancy ...	63 0 0					
69	Travelling Expenses ...	68 13 5					
	Sundry Expenses						
149	Medals and Awards						
98	Miscellaneous Committee Expenses	158 17 3					
	Removal to and Decoration of New Offices ...	227 13 5					
19	Sundries	65 17 1¼					
9	Investment Charges (Midland Bank Executive and Trustee Co. Ltd.) ...	6 16 1					
2,890			3,441 19 0¼				
722	,, SECTIONAL EXPENSES ...		775 2 10				
49	,, DEPRECIATION ON GENERAL OFFICE FURNITURE		48 0 0				
44	MERCER LECTURE EXPENSES ...	39 12 1¼					
20	*Less* Donation	20 0 0					
24			19 12 1¼				
	,, JOURNAL				,, JOURNAL ACCOUNT		
580	Stock 1st Jan. 1952	500 2 6		3,283	Sale of *Journals* and Reprints	4,214 6 5	
7,736	Printing and Publishing ...	7,547 19 1		50	Combined Reports, etc. ...	102 0 2	
530	Postages	522 12 9		6,399	Advertisements	6,641 11 11	
992	Salaries, Honoraria and Wages	1,096 9 7		500	Stock—31st December 1952	580 0 0	
252	Own Journals	361 12 0		10,232			11,537 18 6
243	Abstractors' Fees and Book Reviews	323 3 1					
1	Miscellaneous Publications						
79	Rent, Rates and Insurances	82 0 0					
21	Electricity and Heating ...	18 0 0					
24	Telephone	30 11 6					
53	Printing and Stationery ...	71 9 0					
10,511			10,553 19 6				
	,, ANNUAL MEETING AND DINNER						
28	Meeting	65 15 2					
63	Dinner...	35 3 11					
91			100 19 1				
152	,, DONATIONS						152 2 0
36	,, DONATIONS AND SUBSCRIPTIONS		36 14 6				
6	,, FREIGHT, PACKAGES AND INSURANCE						
34	,, REPAIRS AND RENEWALS ...		49 6 10				
25	,, LEGAL EXPENSES						
40	,, LIBRARY UPKEEP						
	BYE-LAWS		114 3 8				
	,, COLOUR INDEX 2ND EDITION — Expenses incurred but not allowable per agreement with A.A.T.C.C. 1946 to 31st Dec. 1951	527 13 2¼					
	Jan. to Dec. 1952	85 10 9½					
			613 4 0				
	,, FASTNESS TESTS ACCOUNT				,, FASTNESS TESTS ACCOUNT		
93	Stock—1st January 1952 ...	1,490 17 10			Sales—		
1,436	Material purchased	584 18 7		10	Grey Scales	11 2 0	
7	Postages	7 14 10		16	Reports	16 15 6	
	Loose Patterns and Bunches	114 10 0		161	Material	392 17 11	
	Fastness Tests Reports ...	21 15 0			Bunches and Loose Patterns	361 16 6	
	International Conference Expenses	60 13 6		1,491	Stock—31st December 1952	1,510 7 4	
1,536			2,280 9 9	1,678			2,292 19 3
	,, IDENTIFICATION OF DYES ACCOUNT				,, IDENTIFICATION OF DYES ACCOUNT		
87	Stock—1st January 1952 ...	38 10 5		99	Sales	75 8 6	
4	Sundry Expenses	2 14 1			Royalties	12 17 6	
				39	Stock—31st December 1952	4 6 0	
91			41 4 6	138			92 12 0
	,, WOOL DYEING ACCOUNT				,, WOOL DYEING ACCOUNT		
	Stock—1st January 1952 ...	613 17 5		192	Sales	171 2 2	
784	Printing and Publishing ...			294	Advertising		
10	Postages	6 8 6		614	Stock—31st December 1952	500 17 7	
28	Royalties	22 7 0					
822			642 12 11	1,100			671 19 9
	,, REPLIKA COLOUR INDEX AND SUPPLEMENT				,, REPLIKA COLOUR INDEX AND SUPPLEMENT		
	Stock—1st January 1952			1,007	Sales—Index and Supplement	463 11 9	
762	Index and Supplement ...	307 17 9			Stock—31st December 1952		
168	Printing and Binding ...			308	Index and Supplement ...	72 10 11	
74	Sundry Expenses	42 13 10					
1,004			350 11 7	1,315			536 2 8
2,065	,, SURPLUS FOR THE TWELVE MONTHS		3,712 1 7				
£19,946			£22,780 1 11	£19,946			£22,780 1 11

SCHEDULE OF DEVELOPMENT ACCOUNT INVESTMENTS

	Balances 1951	Alterations	Balances 1952	Market Values 1951	Market Values 1952
	£ s. d.		£ s. d.	£ s. d.	£ s. d.
£2,763 3s. 8d. 3% British Transport Guaranteed Stock 1978/88	2,598 17 0		2,598 17 0	2,141 9 4	2,120 14 10
£750 2¾% Funding Stock 1956/61	750 0 0		750 0 0	690 0 0	698 8 9
£546 3½% Conversion Loan	557 0 0		557 0 0	447 14 5	428 5 4
£1,255 2½% Defence Bonds	1,255 0 0		1,255 0 0	1,255 0 0	1,255 0 0
£2,749 16s. 3% Savings Bonds 1960/70	2,750 0 0		2,750 0 0	2,399 4 0	2,351 1 7
£750 2½% Exchequer Bonds 1955	750 0 0		750 0 0	747 3 9	739 4 4
500 National Saving Certificates, 15s. units, 7th issue	375 0 0		375 0 0	375 0 0	375 0 0
£2,000 3% British Gas Stock 1990/95	2,000 0 0		2,000 0 0	1,545 0 0	1,528 15 0
£2017 11s. 6d 3% Treasury Stock 1966 or after	1,957 1 0		1,957 1 0	1,402 4 3	1,369 8 7
£901 3s. 6d. 3% Southern Rhodesian 1971/73	910 13 9		910 13 9	761 9 10	720 18 10
Yorks County Savings Bank	2,489 11 8	£500 invested during year	3,133 10 8	2,489 11 8	3,133 10 8
		£143 19s. 0d. interest			
£1,500 12s. 9d. 3% British Electricity Guaranteed Stock 1968/73	1,495 19 0		1,495 19 0	1,271 15 10	1,259 11 11
Post Office Savings Bank	500 0 0	£17 16s. 8d. interest	517 16 8	500 0 0	517 16 8
£1,000 Chesterfield Corporation 3% Stock 1960	993 15 0		993 15 0	955 0 0	930 0 0
	19,382 17 5		20,044 13 1	16,956 13 1	17,427 16 6

SCHEDULE OF DEBTORS AND PREPAYMENTS

	31.12.1951	31.12.1952
	£ s. d.	£ s. d.
Advertisements	2,022 3 6	1,828 8 10
Combined Reports		1 7 6
Journal	880 8 5	881 4 9
Miscellaneous Publications	1 16 1	2 6
Wool Dyeing	83 13 11	42 17 6
Tinctorial Arts Conference	5 2 6	9 12 6
Reprints	81 14 4	91 6 7
Fastness Tests, etc.—		
Loose Patterns		67 10 0
Fastness Tests	65 5 6	67 0 8
Grey Scale		1 12 0
Replika *Colour Index* and Supplement	432 14 11	189 3 7
Reviews of Textile Progress		2 2 6
Abstracts	5 2 6	10 17 6
Sundries	36 14 6	9 6
Freight, Insurance, and Packing		27 8 6
Photochemistry Symposium	38 14 8	25 6 8
Identification of Dyes	40 2 3	16 5 2
Membership		22 15 3
Postage		8 0
Rates and Insurances in advance	29 1 8	28 8 9
Income Tax Repayment due	94 10 3	101 12 8
Subscriptions and Donations	150 0 0	150 0 0
Textile Institute	36 17 10	
Colour Index (2nd edition)—General		46 10 6
Printing and Stationery		7 10 0
	£4,004 2 10	£3,620 1 5

SCHEDULE OF CREDITORS AND AMOUNTS ACCRUED

	31.12.1951	31.12.1952
	£ s. d.	£ s. d.
Printing and Stationery	4 8 5	
Accountancy and Professional Charges	63 0 0	63 0 0
General Expenses	130 6 0	39 13 5
Sectional Expenses	13 14 6	26 9 11
Sundry Publications	35 15 4	
Journal Expenses—		
Printing and Publishing	2,776 13 2	1,323 6 4
Postages	105 19 4	75 19 9
Reprints		26 5 0
Amounts received in advance	10 11 6	76 18 6
Miscellaneous Committees		15 0 11
Royalties	28 11 6	
Fastness Tests		100 0 0
Colour Index (2nd edition)—		
General		21 12 0
A.A.T.C.C.		4,668 10 0
	£3,168 19 9	£6,436 15 10

SUMMARY OF STOCKS

	31.12.1951	31.12.1952
	£ s. d.	£ s. d.
Fastness Tests and Materials	1,500 17 5	1,510 7 4
Journals	500 2 6	540 0 0
Photochemistry Symposium	23 9 0	15 17 4
Replika *Colour Index* and Supplement	307 17 9	72 10 11
Identification of Dyes	38 10 5	4 6 0
Wool Dyeing	613 17 5	500 17 7
Stationery	144 12 6	181 5 9
Colour Index (2nd edition)—Paper		4,668 10 0
Combined Reports, etc.	17 7 0	143 17 1
Tinctorial Arts Conference		11 4 0
	£3,146 14 0	£7,648 16 0

SCHEDULE OF FOUNDATION FUND INVESTMENTS

	Balances 1951	Balances 1952	Market Values 1951	Market Values 1952
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
£1,245 2½% Defence Bonds	1,245 0 0	1,245 0 0	1,245 0 0	1,245 0 0
1,000 National Savings Certificates, 10s. units, 8th issue	500 0 0	500 0 0	500 0 0	500 0 0
£68 2s. 6d. 3% Savings Bonds 1960/70	69 9 0	69 9 0	59 14 0	58 10 0
Midland Bank (cash awaiting investment) No. 2 a/c	36 4 0	36 4 0	36 4 0	36 4 0
	£1,850 13 0	£1,850 13 0	£1,840 18 0	£1,839 14 0

GEORGE DOUGLAS LECTURE FUND

£1,983 17s. 0d. 3% British Transport Stock 1978/88	£2,000	£2,000	£1,537 9 8	£1,522 12 1

KNECHT MEMORIAL FUND

£98 16s. 6d. 3% Southern Rhodesia 1971/73	£100	£100	£83 10 2	£79 1 2

SCHEDULE OF OFFICE FURNITURE AND FITTINGS

	General		Colour Index (2nd Edition)		Library	
	1951	1952	1951	1952	1951	1952
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
BALANCE 1.1.1951	391 19 8	378 9 8	107 0 0	96 0 0	68 17 6	65 2 6
ADDITIONS	28 10 0	29 1 9		12 2 4	3 5 0	4 0 0
	420 9 8	407 11 5	107 0 0	108 2 4	72 2 6	69 2 6
Less Depreciation @ 10% p.a.	42 0 0	41 0 0	11 0 0	11 0 0	7 0 0	7 0 0
	£378 9 8	366 11 5	96 0 0	97 2 4	65 2 6	62 2 6

There had been a good response to the prepayments scheme for the Second Edition of the *Colour Index*, launched since the end of the year, but in view of the size of the work many more orders would be welcome.

It was with regret that he had to tell the meeting that Dr. C. M. Whittaker, under whose presidency he had served his first year as Honorary Secretary, had decided to resign from the various committees on which he had given valuable service over many years. Dr. Whittaker was still young in spirit and indeed still full of activity, but he insisted on the younger men playing their part. It was a pleasure to thank Dr. Whittaker on behalf of Council for all he had done for the Society.

He would like to thank the President and Members of the Council, and especially the Honorary Treasurer, for their kindness to him. It had been a pleasure to work with everyone, and it was a matter of regret that the time was approaching when, because of other commitments, he would have to withdraw from the Honorary Secretaryship of the Society.

Dr. H. W. ELLIS, in seconding the motion, said that the Report was of great interest, and he had been very pleased to hear Mr. Barritt mention the London Lecture.

The motion was carried.

ANNUAL ACCOUNTS

The Honorary Treasurer (Mr. H. JENNISON), in presenting the accounts for the year ended 31st December 1952, copies of which had been sent to members six weeks earlier, said that, with the object of making the accounts as simple and concise as possible, they had been drawn up in a new form, the Sundry Accounts having been included in a Consolidated General Revenue Account. Only the accounts relating to the Second Edition of the *Colour Index* and the George Douglas Accumulation Fund had been kept separate.

There had been few substantial increases in normal expenditure, the slight rise in the General Office account being accounted for largely by the increased rent of the new offices. Although the Consolidated General Revenue Account showed a surplus for the year of £3712 compared with £2065 for 1951, expenditure on the production of the Second Edition of the *Colour Index* had been £2654, which was largely accounted for by Customs duty and transport charges on the paper imported from America. During the coming two or three years we would be faced with considerable expenditure on the *Colour Index*, and it was in order to meet this situation that the prepayments scheme had been launched. Although the response so far had been quite good, the Finance Committee earnestly solicited support of the scheme by all those interested in the publication of the Second Edition of the *Colour Index*.

Mr. A. E. CONWAY seconded the motion, which was carried unanimously.

ELECTION OF PRESIDENT

Mr. H. H. BOWEN, in moving the election of Mr. F. L. Goodall as President, said that he was known to many members personally, and was well known to a wider circle for his work on wool dyeing, for which he had been awarded the Gold Medal of the Society. Mr. Goodall had rendered great service to the Society. As Vice-chairman of Council, he had on many occasions taken the chair. He had been most helpful in administrative matters, and had often attended meetings at considerable inconvenience to himself. He was a man of great integrity.

Dr. C. M. WHITTAKER, in seconding the motion, firstly expressed his personal regret that Mr. Bowen was unable to continue in office for a second year. There was one great difference between the outgoing and incoming Presidents: whereas the former had migrated from Lancashire to Yorkshire in order to learn how to dye, the latter had left his beloved Wharfedale in order to teach Lancastrians how to dye. Mr. Goodall was a tremendous worker. Technically, his chief successes had been concerned with the dyeing of what the Honorary Secretary no doubt still regarded as the best fibre, albeit with apprehensive glances at the new polyamide and polyester fibres. Mr. Goodall's work had made presentable the most unevenly dyeing of all fibres. On Council he would find both molecularly dispersed intellects and the aggregated type, and it was the task of the Chairman of Council to guide these two types to a decision in the best interests of the Society. He had the greatest pleasure in seconding the election of Mr. F. L. Goodall as President of the Society.

The motion was carried with acclamation.

At this point Mr. F. L. GOODALL occupied the chair. He said that his election as President was the highest honour he could have imagined receiving from the Society, and he appreciated it not only for its own sake but also because it had been conferred upon him by Mr. Bowen. He had first taken an active interest in the affairs of the Society as a member of the Publications Committee under Mr. Bowen's chairmanship, and from him he had learned something of the spirit and atmosphere of the Society. An extraordinary amount of goodwill was shown by the membership for the Presidency. He hoped that he would do nothing to vitiate this goodwill, and that he might do something to enhance it.

VOTE OF THANKS TO RETIRING PRESIDENT

Mr. G. M. WILLIAMS, in moving a cordial vote of thanks to the retiring President, Mr. H. H. Bowen, said that, many years ago, as a very shy recruit to the Society, he had met Mr. Bowen with some trepidation, but had soon been put at ease by Mr. Bowen's old-world courtesy. He wished to join Dr. Whittaker in regretting that Mr. Bowen could not continue in office for a second year, as he had been a most dignified President of the Society.

Mr. J. MONTGOMERY, in seconding the vote of thanks, said that the office of President entailed many duties with few privileges, and it would appear that Mr. Bowen had done two years'

work in one. He wished Mr. Bowen every happiness in the future.

The motion was carried with acclamation.

Mr. BOWEN, in reply, expressed his thanks for the kind words and the charming manner in which they had been expressed. It was a disappointment to him that it had proved impossible for him to continue as President for a second year. He had been shown many kindnesses during the past year, and any success he had attained had been due to the efforts of the officers, members of Council, and the permanent staff.

ELECTION OF A VICE-PRESIDENT

The President said that, as under the new Bye-laws passed at the 1952 Annual General Meeting there was only one vacancy, and as only one nomination had been received, he had great pleasure in declaring Mr. Fred Smith elected a Vice-president of the Society, and in welcoming him to that office.

ELECTION OF ORDINARY MEMBERS OF COUNCIL

The Honorary Secretary, in accordance with a decision of Council (J.S.D.C., **68**, 213 (June 1952)), read out the results of the postal ballot —

Mr. D. A. Derrett-Smith ...	317 votes
Mr. N. Hamer	361 votes
Mr. A. P. Kershaw	324 votes
Mr. J. V. Summersgill ...	346 votes
Mr. A. G. Tyler	282 votes
Mr. E. Waters	205 votes

A total of 541 ballot papers had been received, of which 22 had been spoilt.

The President then declared Messrs. D. A. Derrett-Smith, N. Hamer, A. P. Kershaw, and J. V. Summersgill elected as Ordinary Members of Council. He welcomed them to Council, and felt sure that they would greatly strengthen it.

VOTE OF THANKS TO SCRUTINEERS

A hearty vote of thanks to the scrutineers (Mr. E. Stead and Mr. R. Grice) was proposed by Mr. G. E. STYAN, who said that the large number of votes cast indicated the amount of work involved, seconded by Mr. D. MCCORDALL, who paid tribute to the quick, accurate, and efficient work of the scrutineers, and carried.

VOTE OF THANKS TO RETIRING VICE-PRESIDENTS AND ORDINARY MEMBERS OF COUNCIL

Mr. FRED SMITH, in proposing a vote of thanks to the retiring Vice-presidents and Ordinary Members of Council (viz. *Vice-presidents*— Mr. F. Farrington, Mr. F. L. Goodall, Mr. J. M. Goodall, and Mr. J. M. Preston; *Ordinary Members of Council*— Professor W. Bradley, Dr. R. L. Elliott, Mr. A. Thomson, and Dr. T. Vickerstaff), said that it was a pleasure to pay tribute to them. Their contributions had been of a high standard, and therefore they would be difficult to replace. It was satisfactory to know that they would be able to continue their work on the various committees of the Society.

Mr. A. P. KERSHAW, in seconding the motion, said that all had given yeoman service during their period of office, and he trusted that the time was not far distant when they might serve again.

The motion was carried unanimously.

ELECTION OF HONORARY TREASURER

The President declared that, no other nomination having been received, Mr. H. Jennison was re-elected Honorary Treasurer. He felt sure that this Society could not have a better Treasurer, as was shown by the Balance Sheet: in 1934, Mr. Jennison's first year as Honorary Treasurer, the accounts had shown a surplus of £85, the first surplus for many years.

ELECTION OF HONORARY SECRETARY

The President declared that, no other nomination having been received, Mr. J. Barritt was re-elected Honorary Secretary. Although Presidents came and went, the Honorary Secretary seemed to go on for ever. It was a difficult decision for Mr. Barritt to have to relinquish the office within the near future, and a sad blow to the Society. They would have to try to lighten the load on Mr. Barritt, and if they could not persuade him to change his mind they knew that he would always have a warm interest in the Society.

Mr. BARRITT said that he had many other commitments, and especially the work on the Second Edition of the *Colour Index*, would occupy a great deal of his time during the next two years. His employers, the Wool Industries Research Association, had been extremely generous to the Society in allowing him to spend so much time on its affairs.

APPOINTMENT OF AUDITORS

Messrs. Rawlinson, Greaves & Mitchell were reappointed auditors to the Society on the motion of Mr. C. O. CLARK, seconded by Mr. F. HARRISON.

VOTE OF THANKS TO CHAIRMEN

Dr. H. A. THOMAS, in proposing a cordial vote of thanks to the President and the Immediate Past President for their chairmanship of the meeting, said that their singleness of purpose had been shown by their having brought the meeting to a successful conclusion in spite of the strong counter-attraction of a television rehearsal in an adjoining room.

Mr. J. PORTER, in seconding the vote of thanks, said that members in Northern Ireland knew Mr. Bowen very well, since he had twice attended the Annual Dinner of their Section. They did not know Mr. Goodall so well, but hoped to get to know him better and trusted that he would visit them in Northern Ireland.

The motion was carried with acclamation.

Mr. GOODALL expressed his own and Mr. Bowen's appreciation of the vote of thanks.

Annual Dinner

The Sixty-ninth Annual Dinner of the Society was held at the May Fair Hotel, London W.C.1, on Friday evening, 10th April 1953, under the presidency of Mr. F. L. Goodall.

The principal guest was the Right Honourable the Earl of Halsbury (*Managing Director of the National Research Development Corporation*). Among other guests were Mr. C. G. Hayman (*Chairman of the Association of British Chemical Manufacturers*), Captain C. B. Tidd, R.N. (*Prime Warden of the Worshipful Company of Dyers*), Mr. C. R. Egerton (*Renter Warden of the Worshipful Company of Dyers*), Sir William Palmer, K.B.E., C.B. (*Chairman of the British Rayon and Synthetic Fibres Federation*), Mr. A. C. Hill and Mr. G. L. E. Metz (*Board of Trade*), Mr. C. G. Hulse (*Secretary of the Dyestuffs Control, Board of Trade*), Mr. F. Courtney Harwood (*Director of Research of the British Launderers Research Association*), Dr. H. J. White, Jr. (*Textile Research Institute, Princeton, N. J.*), Mr. L. E. Jones (*Honorary Patent Agent*), Mr. D. Beaumont, Mr. P. Caldwell, Mr. R. D. Chorley, Mr. A. J. Crockatt, Mr. G. H. W. Cullinan, Dr. F. J. Siddle, Mr. J. B. Wilkinson, Mr. H. H. Bowen (*Immediate Past President*), and Mr. G. F. Wood (*Chairman of the London Section*).

The following officers and other leading members of the Society were also present—Dr. C. M. Whittaker (*a past president*); Mr. G. B. Angus, Mr. C. O. Clark, Mr. W. A. Edwards, Mr. H. Foster, Mr. R. J. Hannay, Mr. Fred Smith, Dr. H. A. Thomas, and Mr. G. M. Williams (*Vice-presidents*); Mr. J. Boulton, Mr. D. A. Derrett-Smith, Dr. G. T. Douglas, Mr. N. Hamer, Mr. A. P. Kershaw, and Mr. J. V. Summersgill (*Ordinary Members of Council*); Mr. F. Atack, Mr. A. W. Carpenter, Dr. H. W. Ellis, Mr. A. S. Fern, Mr. J. Montgomery, Mr. J. Porter, Mr. E. Rolfe, Mr. G. E. Styan, and Mr. H. Turner (*ex-officio Members of Council*); Mr. H. Jennison (*Honorary Treasurer*); and Mr. J. Barritt (*Honorary Secretary*).

"THE SOCIETY OF DYERS AND COLOURISTS"

After the toast of "Her Majesty the Queen", that of "The Society of Dyers and Colourists" was proposed by—

The Right Honourable the EARL OF HALSBURY (*Managing Director of the National Research Development Corporation*). Following a speech which ranged from the difficulties of an amateur trying to apply a dye to a fabric, through those of a colour-blind man who found himself chief colour matcher in a dye works, to those of a bishop who found himself caught in a thunderstorm, Lord Halsbury ended with these words—

"What a wonderful and colourful spectacle is presented to us by Nature and how beautiful are her works—the gold-green scarabs of Egypt with their almost unimaginable lustre; the flowers of our gardens; the sunsets and rainbows in our sky; and many other manifestations which sometimes owe as much to physics as to chemistry. How drab must the man-made world have been until the discovery of artificial dyes nearly a century ago. I used to read at school of how some long-dead individual had donned the imperial purple when he became Emperor in Rome, and yet what was the imperial purple? It sounds very impressive, but it cannot have been much more than an off-white woollen blanket with a blackberry-coloured fringe. I don't know whether in donning the modern equivalent of the imperial purple Mr. Malenkov will appear more colourful than the Roman Emperors did, but, should he be so disposed, what a much wider range is open to him. What a drab and dreary place our man-made world would still be but for your art and your craft, skills which have probably done as much good for as little harm as any other scientific discoveries that I could think of."

Mr. F. L. GOODALL (*President of the Society*), in responding to the toast, warmly thanked the chief guest for his stimulating talk.

It was indeed an honour and a privilege to address members as their President, following on a long line of distinguished men, of whom the most recent was their old friend, everybody's friend—Harold Bowen. This was a very special year in our national life because it was the year of her Majesty's coronation, and he was indeed sorry that personal reasons prevented our old friend from holding the office of President during this stimulating year. He would have graced the position, as he had done over the past twelve months, with all his personal qualities which have endeared him to so many, and with a background of experience in day-to-day activity in all the constructive matters for which this Society of ours had stood for sixty-nine years.

It was a particular responsibility to be President in coronation year. The Society had existed during six reigns and had seen three coronations, but there was something about the coronation of a young and charming Queen which called for renewed endeavour from all men of goodwill. That the Society was already "endeavouring" could be seen from its Annual Report, which would cover some 3½ pages of the *Journal*, and even then represented a strictly condensed account of all the many activities of the Society. It might be compared with the Annual Report for 1934, the Jubilee year of the Society, which had occupied half a page of the *Journal* and had made no reference whatever to any constructive work being in hand except the completion of the first Fastness Tests report, which was then being printed.

During the nineteen years since the Society's Jubilee, a marked resurgence had taken place in its work, and there had been also a marked change in its fortunes. In 1934 the net assets of the Society had amounted to some 10s. per member, and in the present year they amounted to some £10 per member. There was, however, an important difference. Whereas in 1934 it had been technically possible to wind up the Society's

affairs and distribute its assets amongst the members, now its assets would have to be used for some purpose conforming with the avowed objects of the Society. Thus if, through some failure of ourselves as members, it should ever become necessary to bring the Society's active being to a close, its work would continue in some form or another, though obviously at a reduced tempo. There was happily no fear of that, and indeed what he had to ask members to do in this coronation year and afterwards was to redouble their efforts for the good of the technology and science which the Society represented.

Mr. Goodall's own connection with the Society had started in 1919, just after the close of the First World War, when this country as a whole had become vitally conscious of the need for research, and at every similar function since those days stress had been laid again and again on the importance of research for our national and industrial wellbeing. In those early days the meaning of research had, perhaps, not been fully understood, as was evidenced by the two well established Yorkshire manufacturers who engaged a research chemist and provided a wonderfully equipped laboratory for him to work in. The chemist arrived at 9 a.m. one Monday morning and the two partners sat in their office hugging themselves with excitement and quite unable to carry out their normal duties. At about 11.15 a.m. they could stand the strain no longer, and tiptoed up to the new laboratory, put their heads round the door, and said "Well, lad, hast discovered owt?".

We have travelled a long way in those thirty years as regards prosecution of research and our understanding of what it may do for us and of the time taken to achieve results, but the startling fact is that to-day we have reached a position in this country where research, in pure science at all events, is fast leaving technology behind. Wiser men have been laying stress upon this in more distinguished places. In the U.S.A. it is probably true that the opposite is the case, and that technology, if not surpassing pure science in its development, is at least travelling much more closely in its wake than is the case here. One of the obvious reasons for the difference between the U.S.A. and ourselves is the greater availability in America of funds and physical resources to enable the rapid putting into practice of discoveries in pure and applied science. Another lies in the comparative youth of American executives when contrasted with their counterparts in this country, as stressed again and again by productivity teams returning from America. It is fair to think that by virtue of their youth they have been brought up in a more scientific atmosphere and are in closer touch with modern science than our own people, whose early training in science may be outmoded by time and overlaid by administrative responsibilities.

We are called upon in this country to make a great effort for the improvement in quantity and quality of our technological resources, and this Society will certainly be required to play its full part in this great work. It is already doing so in a great variety of ways, even to the extent of risking in association with its counterpart in America— the A.A.T.C.C.— all its financial resources in the publication of a Second Edition of the *Colour Index*. Its *Journal*, its summer schools and symposia, and the most recent development— a scheme for the award, by no means lightly, of diplomas to qualified technologists— are all evidence of the part the Society has to play.

It must never be forgotten, however, that, whilst the main business of technology is to produce something and therefore depends on a knowledge of materials and machines, it also depends on a knowledge of men. There are no recognised courses at our universities and technical colleges which will give to us technologists a knowledge of men, which can be gained only by taking an interest— a personal interest— in human beings. Somehow or other we must convince our operatives that the work they do, and whether they do it well or ill, is of vital importance to the country as a whole, to their neighbourhood, to the company which employs them, to their wives and families, and to themselves as individuals. We can learn another lesson in this connection from our American friends, who do not describe their staff and their operatives by the word "labour", with all that it implies of drudgery and lack of interest, but by the simple phrase *hired help*. In this phrase the important word is, of course, *help*, and if we could convince our operatives that their work is intended to help in the achievement of some beneficial ideal, as was done throughout the war years in this country, we should take a very great step forward in industrial relations, and in producing a good article in an economical manner at the time when it is needed, which is the fundamental object of technology.

"OUR GUESTS"

Mr. G. F. Wood (*Chairman of the London Section*) said that his was the very pleasant duty of proposing a toast to our guests. Some of them might not be so well known to members of the Society, and he would therefore introduce them. But before doing so, he was very pleased to announce that telegrams of greetings and good wishes had been received from Mr. G. S. J. White in Melbourne, Australia, and from Mr. H. Palfreeman in Canada.

Firstly, the principal guest, the Right Honourable the Earl of Halsbury, was both Managing Director of the National Research Development Corporation and a member of the Advisory Council of the Department of Scientific and Industrial Research. The former body, set up by the Board of Trade under the provisions of the Development of Inventions Act 1948, was doing a valuable service in exploiting and developing inventions resulting from research carried out by Government departments and other public bodies; while we were very grateful for the good work of the D.S.I.R. and for its monetary grants to the industrial research associations.

It was a pleasure to have with us Captain C. B. Tidd, R.N., the Prime Warden, and Mr. C. R. Egerton, the Renter Warden, of the Worshipful Company of Dyers. The Society was grateful for the continued interest of the Company shown notably by the award of the Company's gold research medal and the beautiful presidential badge. The recipient for 1952, Mr. H. H. Hampson, was a keen worker on practical dyeing problems.

We were glad to welcome also Messrs. A. C. Hill, C. G. Hulse, and G. L. E. Metz of the Board of Trade. We were grateful for their close interest both in the dyes and chemicals we used and in the textiles to which they were applied.

Another welcome guest was Sir William Palmer, Chairman of the British Rayon and Synthetic Fibres Federation, who had graced the platform at the inaugural London Lecture of the London Section. Sir William served the industry also as Chairman of the Textile Divisional Council of the British Standards Institution and in many other ways.

The users of dyes were very well represented by Mr. P. Caldwell, a member of a large association of yarn and slubbing dyers, members of whose staff were keen and active members of the Society; and Mr. A. J. Crockatt, who had contributed so much to the garment dyeing and cleaning trade. Another guest, Mr. F. Courtney Harwood, Director of Research of the British Launderers Research Association, represented both a not unrelated industry and the research associations, which were doing great work in improving the efficiency of British industries by investigating the underlying scientific phenomena.

The makers of dyes and chemicals graced our board in the persons of Mr. D. Beaumont, Mr. G. H. W. Cullinan, Dr. F. J. Siddle, and Mr. J. B. Wilkinson. The Society was grateful to these firms for the interest they displayed in its varied activities and especially for the lectures given by members of their staffs.

We were particularly pleased to welcome Mr. R. D. Chorley, of Messrs. Chorley & Pickersgill Ltd., printers of the *Journal* for the past fifty years, who were to be congratulated on its pleasant and colourful appearance. We were glad also to have with us Mr. L. E. Jones, our Honorary Patent Agent.

One of our guests that evening, Dr. H. J. White, Jr., of the Textile Research Institute, Princeton, New Jersey, had arrived on his first visit to our country only two days earlier, and we extended to him a hearty welcome both to Great Britain and to our Society. We looked forward to hearing his lectures on the application of the modern technique of radioactive tracers to textile research.

Lastly, but by no means least, we had to thank most warmly Mr. C. G. Hayman, Chairman of the Association of British Chemical Manufacturers, for undertaking at relatively short notice to reply to this toast. Through Mr. Hayman we would like to send greetings to all members of the A.B.C.M., whose products were of such value to both dyemakers and dye-users, and we could assure him that he had no need to bring samples of either his potent distillate, penicillin, or plastics to be certain of a hearty welcome.

Mr. C. G. Hayman (*Chairman of the Association of British Chemical Manufacturers*) said that he was neither a Yorkshireman nor a Lancastrian, but a Cockney, though in Scotland he found it politic to be "a wee Sassenach".

It was his privilege to respond to the very cordial toast just proposed. He was very conscious of being in the presence of experts, and although he had had a long working association with the chemical industry, he felt something of awe, if not of mental indigestion, in trying to understand the technical ramifications of our great industry. Even so, and just as a layman, he would like to pay a tribute to the immense growth and fertility of the dyemaking industry in this country. Few, if any, of our industries could claim such spectacular growth during the past forty years. This was only incompletely illustrated by stating that, with the aid of the Dyestuffs Import Regulation Acts of 1920 and 1934, production in 1951 was ten times by weight that of 1913. This was an inadequate acknowledgment, because it did not reflect or portray in detail the successful challenge to powerful Continental competition by the brilliant technical progress achieved, which, whilst serving the interests of dyemakers and the textile industries, had continually opened up vital developments in the general organic chemical field.

The title of the Society clearly showed that the dyers and the colourists recognised their common interests, which demanded the fullest collaboration. Thus the Dyestuffs Import Regulations should not be regarded or exercised as a barrier, but rather as a protection of properly discharged functions. This meant that certain types of dyes must be imported because they might not be manufactured here, and in view of the constant changes in this virile industry, these imports should be regarded as a stimulus to greater effort in research and development in this country. In that way we would be better able to keep abreast of changes and improvements which might be vital to the competitive position of the users.

In conclusion, Mr. Hayman thanked the Society for its very kind hospitality and for the good company he and his fellow guests had enjoyed. In wishing every success to the Society, they also expressed their confidence that the skill and knowledge of members of the Society would be equal to the challenge of these exacting and competitive times.

The Structure and Properties of Natural and Allied Fibres

W. R. MOORE

Meeting of the Summer School held in Loughborough College on 25th August 1952, Dr. R. L. Elliott in the chair

INTRODUCTION

Natural and allied fibres include the keratin fibres, of which wool is the best example, silk, cellulose fibres, both natural and regenerated, and cellulose acetate. Since the properties of fibres are many and varied, consideration will be restricted to those which are related to structure and which are of importance in the interpretation of dyeing and common textile processes. The fibres to be considered differ in many ways—structurally, chemically, and physically—but there is a general structure common, in some degree, to all. This general structure is based on the fact that fibres are built up from very long molecules, which are chains of simple molecules each of which can be regarded as a link in the chain. In wool and silk the links are amino acids, in cellulosic fibres they are glucose units. Many millions of such chains go to form a single fibre.

Within the fibres there are two limiting ways in which the chains may be arranged—They may be arranged in orderly bundles in which the chains are parallel and evenly spaced. Such bundles, which are termed *crystallites*, *crystalline regions*, or *regions of order*, are about 50 A. thick in cellulose fibres and about ten times as long. The other limiting way is a random disorderly arrangement of chains to give what are termed *amorphous regions*. A diagrammatic representation of such arrangements is shown in Fig. 1. This is a very simple representation, and the division into crystallites and amorphous regions is by no means as clear cut as it might suggest. As P. Hermans [1] points out, these two modes of arrangement must be regarded as limiting types, and the chains in an actual fibre will have many different arrangements varying from a completely ordered to a completely random one. It should be noted that, since a chain is generally longer than a crystallite, such a chain will form part of both crystallites and amorphous regions. In the diagram the crystallites are shown as oriented roughly parallel to the fibre axis. This may be so, but the crystallites may be oriented at an angle, and in regenerated cellulose fibres the orientation may be rather random.

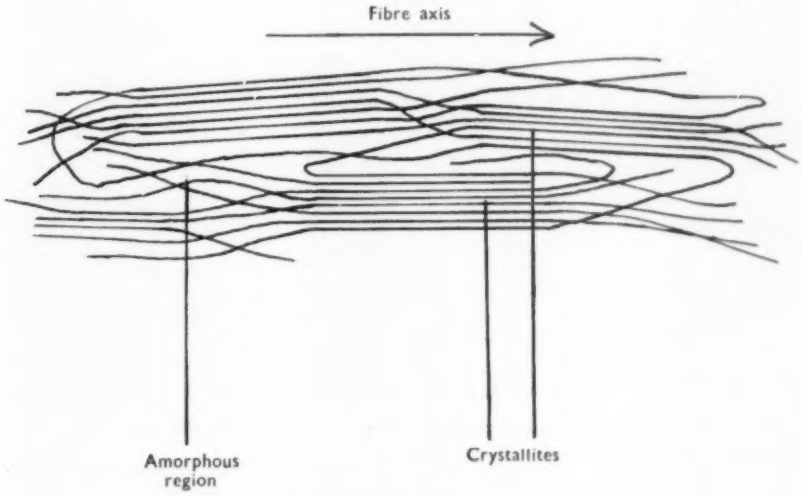


FIG. 1—Two-phase Structure of Fibres

METHODS OF STUDYING FIBRE STRUCTURE

This general picture of fibre structure has been obtained from studies of certain physical properties of fibres. The more important methods of study include the use of X-rays and determinations of moisture regains, densities, and refractive indices. X-Ray studies are possibly the most fundamental, as it is from these that the general picture of fibre structure is obtained. The crystallites have the property of diffracting X-rays, and when a parallel beam is passed through a bundle of fibres and the diffracted beam allowed to fall on a photographic plate, a regular pattern is obtained, a typical result being shown in Fig. 2. From such diagrams it is possible to deduce the presence of crystallites and amorphous material, and to obtain information on the size and extent of crystallites and the configuration of single chains in them. Comparison of the X-ray diagrams for unstretched and stretched wool together with a consideration of the elastic properties of the fibre indicates that the chains in

wool are folded. In silk and cellulosic fibres the chains in the crystallites are extended.

The other methods of study yield more general information, chiefly on the degree of crystallinity, but also, in some cases, on the size of crystallites, their orientation, and the presence of polar groups on the chains. The use of moisture regain studies depends on the fact that regains, at a given temperature and relative humidity, are governed primarily by two factors—

(*a*) The degree of crystallinity of the fibre. At least with cellulosic fibres, entry of moisture is almost entirely confined to the amorphous regions [2,3].

(*b*) The presence of polar groups on the fibre chains. At not too high relative humidities moisture appears to be taken up only at certain polar groups, presumably by means of hydrogen

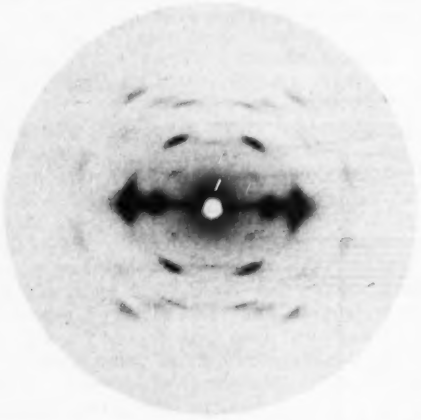


FIG. 2.—X-Ray Diffraction Photograph of Natural Cellulose (Ramie)

bonds. The groups concerned are hydroxyl (OH) groups in cellulose fibres and carbonyl (CO) groups in protein fibres. Thus at 65% R.H. and 20°C. wool has a regain of 16% and silk 12%, the greater regain of wool being associated with its smaller degree of crystallinity and greater number of polar groups. Since in all cellulosic fibres the same polar groups are concerned, regain varies in a regular manner with crystallinity (Table I).

TABLE I

Regains at 65% R.H. and 20°C.

Fibre	Crystallinity (%)	Regain (%)
Ramie	70	7
Native cotton	50	10
Mercerised cotton ...	45	12
Viscose rayon	30	14·6

If the crystallinity of one type of cellulose fibre and its regain under specified conditions are known, a knowledge of the regain of another cellulose fibre under the same conditions permits an estimate of its crystallinity [1]. Such estimates are only approximate, since, as Howsmon [4] has shown, regain varies also with the size of the crystallites. Moisture is taken up at polar groups in the amorphous regions and at the surfaces of crystallites. A fibre containing many small crystallites will have a somewhat higher regain than one of the same degree of crystallinity but containing larger crystallites.

Density determinations permit comparisons of the degree of crystallinity of fibres of the same chemical type. Such determinations generally involve weighing the fibres immersed in a liquid. Liquids may be penetrating or non-penetrating; i.e. they may or may not enter the amorphous regions. With penetrating liquids the lower the apparent density of the fibre the greater the crystallinity, while with non-penetrating liquids the reverse applies. The relationship between crystallinity and density is illustrated by the results in Table II for certain cellulose fibres in water, a penetrating liquid.

TABLE II

Apparent Densities in Water at 20°C.

Fibre	Crystallinity (%)	Apparent Density (g./c.c.)
Ramie	70	1·6100
Native cotton	50	1·6108
Mercerised cotton ...	45	1·6118
Viscose rayon	30	1·6138

Fibres are anisotropic, certain physical properties differing according to the direction in which they are measured. One such property is the refractive index. If this is measured with light vibrating parallel to the fibre axis but travelling diametrically the value obtained differs from that for light vibrating perpendicularly to the axis and travelling diametrically. The difference between these two values is called the *birefringence* or *double refraction* of the fibre. This depends primarily on two factors — the arrangement of chains in the crystallites and the orientation of the crystallites with respect to the fibre axis. Preston [5] has shown that —

$$\cos^2\theta = A + \frac{B}{n_a^2}$$

(θ = angle at which the crystallites are oriented to the fibre axis; A and B = constants for a particular fibre; and n_a = refractive index measured with light vibrating parallel to the fibre axis). It is also found that the average refractive index (the mean of the values obtained from measurements with light vibrating parallel and perpendicular to the fibre axis) can be related to crystallinity. This follows since density and refractive index are related. The amorphous regions have a lower density than the crystallites and hence a lower refractive index. The average refractive index increases with crystallinity, and for fibres of the same chemical type and orientation it is a measure of crystallinity.

A further very important property which is related to structure is swelling, as it is one of the most characteristic properties of fibres that they swell when immersed in certain liquids, the most important from the dyeing aspect being water and aqueous solutions. Swelling is anisotropic, being nearly always greater radially than longitudinally. Thus, in water wool increases by 18% in diameter but only by 1·2% in length. Swelling results in the separation of fibre chains, and from the general picture of fibre structure it will be expected that

this will occur mainly in a lateral direction. Generally, fibres swell as a result of imbibition of liquid into the amorphous regions, although in some cases penetration into crystallites may occur and modify the arrangement of chains in these regions. Swelling varies with the fibre, the swelling liquid, and the temperature. It is often necessary to swell a fibre in order to open up regions in the fibre which would otherwise be inaccessible to large dye molecules.

THE STRUCTURE AND PROPERTIES OF CERTAIN FIBRES

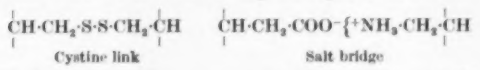
Properties such as anisotropic swelling and birefringence are common to all fibres because of the general pattern of fibre structure. Variations on this common structural theme cause corresponding variations of these properties and of others, such as extensibility and crease resistance, which are important in textile processing. In considering such variations, it is convenient to deal with the fibres concerned in turn.

Wool

Wool is an example of a natural keratin fibre, the chains being built up of amino acids in the form—

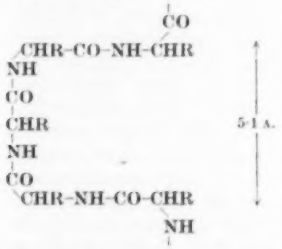
$$-NH\cdot CHR^1\cdot CO\cdot NH\cdot CHR^2\cdot CO\cdot NH\cdot CHR^3\cdot CO-$$

where the Rs represent the same or different organic radicals. The molecular weight of the chains is believed to vary from 2,000 to 12,000. Physicochemical evidence suggests that the chains are arranged roughly parallel to the length of the fibre and joined by cystine links between neighbouring chains. These links involve methylene groups and sulphur atoms. Neighbouring chains are also linked by *salt bridges*, electrostatic attractions between charged carboxyl groups on a side-chain belonging to one chain and charged amino groups on side-chains associated with neighbouring chains. These two kinds of link may be represented thus—

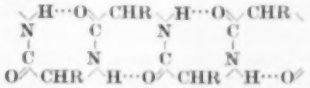


Hydrogen bonds may occur between CO and NH groups on the same or neighbouring chains. These bonds and the salt bridges are physical in nature, and may be more easily broken than the cystine links, which involve chemical bonds.

X-Ray studies by Astbury[6] have shown that the chains are folded. The precise nature of the fold, called the α-keratin configuration, has been the subject of considerable study. A simple representation of Astbury's configuration is—

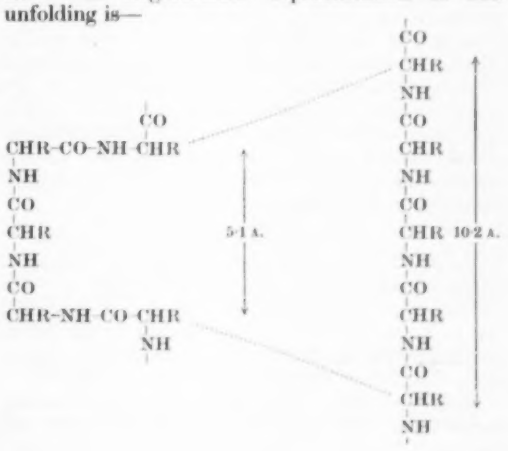


the length of the repeating chain unit being 5·1 A. Recent work, involving infrared absorption and X-ray diffraction studies combined with considerations of bond angles and interaction between groups, suggests that this simple picture must be modified. Stereochemical considerations led Shimanouchi and Mizushima[7] to propose a new structure for α-keratin. Bamford, Hanby, and Happey[8] and Ambrose and Elliott[9] adopted the configuration—



to account for their work on infrared absorption and X-ray diffraction with polypeptides and proteins. The dotted lines indicate hydrogen bonds. This ribbonlike structure has been criticised on the grounds that it involves too much distortion of amide groups and hydrogen bonds to be energetically acceptable. It would seem that the most probable α-keratin configuration may be that suggested by Corey and Pauling[10,11], in which the chains of amino acids are in the form of a helix with about 3·6 amino acid residues per turn. Perutz[12] has obtained X-ray diffraction data which are cited as strong evidence in favour of the Corey–Pauling structure. Possibly only the crystalline regions possess orderly folded chains, the remainder being more disorganised and amorphous. In the crystalline regions the chains may be regarded as folded, neighbouring chains being linked by cystine and salt bridges. Hydrogen bonds between neighbouring CO and NH groups on the same or different chains help to maintain the folded configuration.

The simple Astbury α-keratin structure has provided a basis for the interpretation of some of the properties of the wool fibre. Dry wool can be stretched about 20% of its original length. Treatment with swelling agents such as water may weaken the salt bridges and break hydrogen bonds, extension of the fibre up to 100% of its original length now being possible. When the stretching force is released, the fibre returns to its original length. X-Ray examination of the extended fibre shows that the chains have adopted a much more extended structure, called the β-keratin configuration. A diagrammatic representation of this unfolding is—



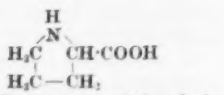
the length of the chain unit having increased from 5·1 to 10·2 A.

The cystine links can be broken by steam or hot water. If this is done while the fibres are in the extended state and the extension is maintained, it is found that on eventual release of the stretching force the fibre does not contract but remains extended, a condition known as *permanent set*. This occurs because new chemical bonds, salt bridges, and hydrogen bonds between extended chains are formed, preventing a return to a folded configuration. If the fibres are extended under conditions which break cystine links and the extending force is then released, the fibre may contract to less than its original unstretched length, a condition termed *supercontraction*. New chemical and physical bonds between extended chains have not been formed, and it is probable that the chains have adopted an even more folded configuration than in the α-keratin structure. Such interpretations of the extensibility of wool fibres and accompanying phenomena are strong evidence in favour of folded chains, whatever the precise nature of the fold. From the practical point of view, it will be seen that the wool fibre, plasticised by water, heat, and chemical action, is capable of elongation to double, or contraction to less than, its original length and of permanent set in an extended state.

Wool and some other fibres of the α-keratin type differ from silk and cellulosic fibres in the possession of scales. Electron-microscopic studies by Lindberg and Gralén [13] and by Mercer and Rees [14] suggest that there is an outer complex cuticular layer involving the scales. This consists of three layers— a resistant *epicuticle* about 100 A. thick forming a sheath over the fibre, an *exocuticle* readily digested by trypsin, and a more resistant *endocuticle* lying next to the cortex. The cortex contains cortical cells which are composed of fibrils and microfibrils in an amorphous matrix and contain both crystallites and amorphous regions. Medullar cells may be present in medullated fibres. It is probable that the mode of dye absorption and the results of certain textile processes are determined, at least in part, by the properties and state of these different histological phases. It seems likely that dye penetration occurs at discontinuities in the outer layers. The first attack of chemical agents is at the cuticle. Gralén says that the low friction of undamaged wool is due to the epicuticle, and disorientation of the surface structure appears to be necessary for the production of non-felting wool by chemical methods. Elliott and Manogue [15] have shown that various non-felting treatments result in a definite change in the surface structure.

Silk

Like wool, silk is a protein fibre, the chains of amino acids forming a protein called *fibroin*. Silk differs from wool in that the chains are extended in a β-configuration. The amino acids which predominate are glycine $NH_2 \cdot CH_2 \cdot COOH$, alanine $CH_3 \cdot CH(NH_2) \cdot COOH$, and serine $HO \cdot CH_2 \cdot CH(NH_2) \cdot COOH$, although others, particularly tyrosine $p\text{-}HO \cdot C_6H_4 \cdot CH_2 \cdot CH(NH_2) \cdot COOH$ and proline—



are important. Those parts of the chains consisting of glycine, alanine, and serine residues fit more readily into an ordered structure to give crystalline regions. The bulky nature of the tyrosine and proline residues prevents their fitting into such a structure, and these residues tend to occur in amorphous regions or to be associated together in discrete parts of the fibre [16]. Hydrogen bonding between chains occurs in the crystallites.

Because of the extended nature of the chains, the extensibility is much less than that of fibres of the α-keratin type. The extension of a fibre is controlled by the length, orientation, and configuration of the chains and by the forces holding them together. The silk fibre exhibits considerable resistance to extension under relatively low stretching forces. Stronger forces may cause easier extension by slipping of extended chains.

Cellulosic Fibres

Cellulosic fibres, both natural and regenerated, differ in certain respects from protein fibres. The chains, built up from glucose residues, may fit more readily into an ordered lattice, and the forces between chains— mainly hydrogen bonds between hydroxyl groups on neighbouring chains— are fairly strong. Because of this relatively easy formation of a lattice, crystallinity may be well developed, particularly in native cellulose fibres. The degree of crystallinity of ramie is about 70%, that of native cotton about 50%. Regenerated fibres have lower degrees of crystallinity, usually about 30%.

There are other differences between native and regenerated fibres. The unit cell— the fundamental unit of the crystallite— differs in arrangement and dimensions. This is shown diagrammatically in Fig. 3, the lines representing the approximate orientation of the glucose residues. Some water may enter the crystallites of regenerated cellulose, although the bulk enters the amorphous regions. P. Hermans [1] has distinguished between two hydrates of cellulose— Hydrate I, with a composition corresponding to one molecule of water per glucose residue, and Hydrate II, corresponding to four water molecules per glucose residue. The crystalline regions may form Hydrate I and the amorphous regions both hydrates. These views of Hermans are not, however, generally accepted.

Another difference between native and regenerated fibres is shown by the general orientation of the chains with respect to the fibre axis. In all fibres the chains are oriented preferentially in the direction of this axis. With regenerated fibres the orientation is more random than in native cellulose. As a result, longitudinal swelling, while still much less than lateral, is greater than that of native fibres. The longitudinal swelling of the latter in water is never greater than about 2%, the lateral swelling varying from 14% to 20%. That of regenerated fibres is 3–5%, with a lateral swelling of about 26%, the high value being due to low crystallinity. The orientation of the crystallites

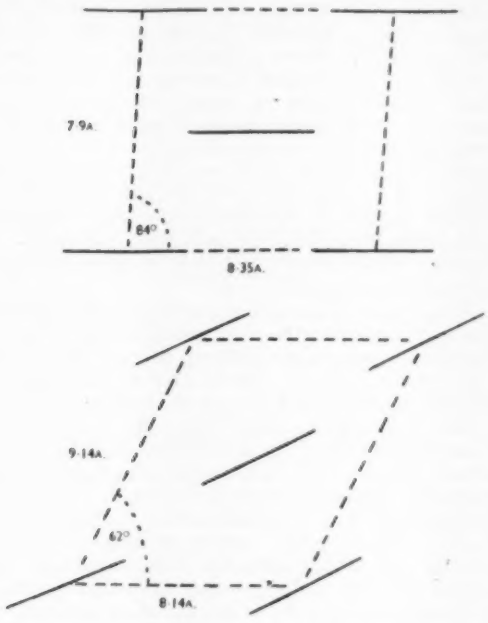


FIG. 3—Unit Cells of Native Cellulose (above) and Regenerated Cellulose (below) seen along the axes of chains

also differs in native and regenerated fibres. In native cotton the crystallites are arranged spirally at an angle of 30° to the fibre axis; but in regenerated fibres the crystallites, while oriented roughly parallel to the axis, are in some degree randomly oriented. Preston and Joshi [17] find an interesting difference in the orientation of the crystallites in different types of regenerated cellulose fibres. In viscose rayon fibres the orientation with respect to the fibre axis decreases from the surface inwards. In cuprammonium fibres the reverse is the case. The latter state is said to be preferable from the point of view of mechanical behaviour.

The extensibility of different cellulosic fibres varies from 5 to 40% at the breaking point. Such differences can be correlated with differing degrees of orientation of crystallites. The crystallites can be regarded as inextensible, and the most perfectly oriented fibres have very small extensibility. If the crystallites are not perfectly oriented, extension can occur by the straightening out of the crystallites parallel to the fibre axis. The fibre will become progressively better oriented as it is extended until, at a stage corresponding to perfect orientation, further extension cannot occur, additional stretching causing breakage. Preston [5] has shown that, if θ is the average angle at which the crystallites are oriented to the fibre axis, then—

$$\text{Extensibility } (\%) = 100(1 - \cos\theta)$$

One of the effects of mercerisation without tension is to decrease orientation, so that, as might be expected, contraction occurs. There would appear to be good correlation between fibre strength and crystallite orientation [18].

Natural and regenerated cellulose fibres also differ in surface structure. The primary wall of natural fibres contains only about 50% cellulose, the rest being wax and pectic substances. Electron microscope studies show this wall to consist of a fibrillar network without the orientation shown by deeper layers [19]. This primary wall seems to be largely removed in alkaline scouring [20]. All wet-spun fibres show what is known as a *skin effect*, due to an annular region differing in physical characteristics from the interior of the fibre. The formation of this skin begins at the walls of the spinnerets, where a flow effect causes orientation of chains. The surface of the fibre is the first to be coagulated on extrusion, and differing rates of coagulation for surface and interior increase the differences between these two regions. Shrinkage normal to the surface favours surface crystallisation. The net effect is a difference in structure between the skin and interior. The depth of this skin varies with the method of manufacture, and in the case of stretch-spun rayons it may be so great as to lead to the disappearance of the interior or core. The skin may be regarded as a region of higher density, crystallinity, and possibly orientation than the interior. Preston [21] suggests that there is a gradation of crystallite orientation between skin and interior. An important effect of this skin is seen in its action as a retarding membrane in diffusion of dyes. It may decrease the rate of dyeing so much that with normal dyeing times a fibre having a thick skin absorbs less dye than one having a thin skin and appears lighter in colour.

Recent optical and electron microscopic work has led to the suggestion that in cellulosic fibres the crystallites may be arranged in *microfibrils* within the fibre [22–24]. Frey-Wyssling [25] suggests that the cellulose chains and crystallite axes are parallel to the axes of microfibrils which are estimated as being 100–750 A. in thickness. The fibrillate structure of natural cellulose fibres has been recently discussed by Hock [26].

Cellulose Acetate

Because of their mode of manufacture the crystallinity of secondary cellulose acetate fibres is small. The smaller number of hydroxyl groups and their random arrangement on the chains make hydrogen bonding between chains less likely. Moisture regain at a given temperature and relative humidity will be less than that of protein and cellulose fibres, and so also will strength. The packing of cellulose acetate chains in the amorphous regions would appear to be closer than of those in regenerated cellulose fibres. This is shown by the size of the pores in these regions, into which dye molecules may penetrate. In cellulose acetate fibres such pores are only about 10 A. in diameter. Meitner [27] found that viscose rayon would accept and retain only dyes varying in particle size between 12·7 and 66·8 A., while cuprammonium rayon would accept and retain dyes of average particle size 66·8 A. and above.

When the physical properties of different fibres are being compared, it must be noted that some properties may vary with the moisture regain of the fibre. Thus cotton fibres generally increase in strength with increasing regain, while regenerated

cellulose and protein fibres decrease in strength. In protein fibres the decrease is due to reduction of attractive forces between chains. The decrease in strength of rayons is due to a similar reason, penetration of water weakening the lateral cohesion between chains. The increase in strength of native cellulose fibres is due to the water in the amorphous regions acting as a lubricant, releasing internal stresses in long chains anchored to the crystallites and increasing the fibre strength by a more uniform distribution of stress. It is of interest that the strength of highly tendered cotton decreases with regain in a similar way to that of rayon, probably because the breaking of chains in the amorphous regions leaves little internal stress to be released.

Another property depending on structure is crease-resistance. Protein fibres are more resistant than cellulosic fibres, probably because of the greater flexibility of protein chains and their existence in the fibre as a network or grid, joined at a number of points by chemical bonds. In cellulosic fibres the cohesion of the chains is due to physical forces, so that when the fibre suffers a relatively large strain, as in creasing, there are no chemical bonds to direct the fibre back into its original form, and it depends on the entanglement of chains for its recovery.

Orientation of chains also affects crease-resistance, though the effects are a little puzzling at first sight. If a silk filament is stretched its crease-resistance falls. Similarly, the crease-resistance of highly oriented cellulose fibres is less than that of moderately oriented. On the other hand, increase of tension in spinning of rayons increases resistance. These results are relatively simply explained. Regenerated fibres which are poorly oriented show poor crease-resistance, strains causing plastic flow because the chains are not secured at many points within the fibre. As the orientation increases so does the number of hydrogen bonds between chains, recovery from strains and crease-resistance being increased. If, however, a high degree of orientation is attained, many chains are fully stretched. Further strain may cause slipping and plastic flow, with a fall in crease-resistance.

SUMMARY AND CONCLUSION

It has been possible only to outline the structure and some of the physical properties of natural and allied fibres. While such fibres can be regarded as possessing a common basic structure, modifications of this may lead to considerable differences between the different fibres. In wool the chains do not easily fit into a lattice and crystallinity is low. The chains are folded, such folds being maintained by physical forces between chains. These forces are comparatively weak, and unfolding is easy. The fibre has a low strength and, under certain conditions, a high extensibility. In silk, extended chains fit more readily into a lattice, and the fibre is less extensible. In cellulosic fibres the chains fit easily into a lattice, and in native fibres there are relatively strong forces between chains. The fibre is strong with short-range elasticity. Regenerated cellulose fibres differ from native in a number of ways— in the dimensions of the unit cell, in the smaller degree of crystallinity and more random orientation of crystallites, and in the possession of a skin, these differences being reflected in differences in physical properties.

This outline of structure and properties is based on two concepts— the configuration of the chains and the existence, in the fibre, of crystallites and amorphous regions. While this simple picture should possibly be elaborated to include the arrangement of crystallites into fibrils and the surface structures of fibres, it permits the correlation of fibre structure with such important properties as moisture regain, density, birefringence, swelling, extensibility, and crease-resistance. These are only some of the properties related to fibre structure. Others, such as the diffusion of dyes, the amount of dye absorbed under specified conditions, and the orientation of dyes in fibres, all of importance in dyeing, may also be related to fibre structure.

(*MS. received 30th December 1952*)

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Dyeing in the Carpet Trade

A. GAUNT and P. ROBINSON

Meeting of the West Riding Section held at the Victoria Hotel, Bradford, on 30th October 1952, Mr. S. Peel in the chair

The work of the dyer in the carpet industry has a tremendous influence on the ultimate saleability of the finished goods, an influence out of all proportion to the cost or size of the department in relation to the complete process.

The importance of the colouring of a carpet can be very well illustrated by Table I, which sets out the reasons given for selecting a particular carpet or rug.

TABLE I [1]

Criterion	Proportion of Choices
Colour	56
Pattern	20
Inexpensive good value ...	11
Quality	10
Texture or weave	7
Does not show dirt or footprints	6
Durability	5

A complete description of carpet manufacture has been given by Angus [2], so that it is not proposed to enter into a detailed discussion of manufacture in general. It is necessary, however, to consider how the important part played by colour and design affects the dyer in his work.

The feature of the Axminster method of carpet weaving is the possibility of making very complicated designs using a large number of colours. It is not unusual for an Axminster carpet to contain more than fifty shades. Use is made of series of shades which are different depths of the same tone, and the production of these ranges is a matter of considerable skill, particularly when a series is made up of six shades.

Each individual shade has been selected by the designer and the colourist, and it is vital that their conception should be fully realised in the finished carpet. Deviation from the selected shades could mar the design, so that a very high standard of matching is absolutely necessary. As the dyeings of the shades are exhausted in the looms, repeat dyeings become necessary. The new dyeings must match the previous ones accurately, particularly in the case of open ground patterns. It often happens, in fact, that the yarn of any particular shade at the loom will be composed of material from more than one dyeing.

In connection with the question of matching to standards it is worth mentioning that it is imperative that a large standard be kept to avoid the necessity of frequent remaking. This frequent matching could lead, over a period of time, to quite an appreciable variation, owing to the cumulative effect of slight deviations in the matching of the previous standard.

Since carpets are in use under artificial light as well as in normal daylight, the use of dyes which exhibit abnormal changes in artificial light should be avoided at all costs. The shades used in a design should change in a similar way in varying lights in order to maintain the character of the design. Further, when shades are created it is necessary to adhere strictly to the standard range of dyes and avoid the use of additional shading dyes, so that repeat dyeings of the shade will match in all lights. The use of different combinations of dyes to achieve one shade can only lead to controversy and confusion; for example, a shade may be passed in morning light and be considered off shade later in the day. Further, although the presence of the added dye may not be apparent in the carpet in daylight, it may show in artificial light by upsetting the balance of the design.

It follows from this that the dyer should have an efficient filing system and that records of all dyeings should be maintained. It is essential that these facilities should be available in a clean, well lit, and roomy office, so that undue confusion can be avoided.

The primary necessity in the colouring of a carpet is that it should be as fast to light as possible, with the highest degree of fastness to water obtainable. When carpets leave the loom they are not subjected to any wet finishing process, so that the need for wet fastness is not as important as, for instance, in certain branches of the clothing trade, where milling is applied.

The material for the face yarn of carpets can be dyed in various forms, and these in order of decreasing importance are as follows—(i) in the form of yarn, (ii) as loose wool, and (iii) in the piece. These alternatives are, of course, general throughout the wool industry, but the importance attached to each method has rather a different significance in carpet manufacture.

By far the greatest quantity of material is dyed in yarn form, and the method almost universally used for this type of work is dyeing in the hank in the Hussong type of machine. The very high standard of matching of shades already indicated, and the consequent necessity for the use of level-dyeing dyes, restrict the range from which a selection may be made. The accuracy of matching must also be coupled with speed of matching, which is necessary if the yarn is to be in a sufficiently sound condition to resist the type of wear to which it will be submitted in service. The need for speed of matching is also vital in connection with the behaviour of the dyes themselves while present in a boiling dyebath.

A typical selection of dyes for the production of mode shades on carpet yarn is—

Solway Blue PFN (ICI)
Kiton Fast Red BG (CAC)
Xylene Light Yellow 2G (S)

and it will be found that all dye manufacturers recommend a similar combination.

The dyes are dissolved in the boiling bath, sulphuric acid and Glauber's salt are added, and the yarn is entered at the boil. After boiling has continued for 40–60 min., a sample is taken and compared, in the form of a tuft, with the standard. Additions of dyes are then made until the shade is matched. It is not usual to wash off the yarn after dyeing. Some dyers prefer to enter the yarn at a lower temperature. The liquor from one dyeing is often used for another lot after the required additions of acid and dyes. In this way steam and time are saved. The small amount of residual dye in the liquor presents no great difficulty to an experienced dyer, who will use his discretion in deciding the sequence of the shades to be dyed.

For dark reds and blacks, which are obtained with dyes with poorer migration properties, the yarn is entered at 110°F., brought to the boil in 60 min., and boiled for 40 min. Any additions necessary are made with migrating dyes.

Acid reds of the Kiton Red G (CAC) type and mixtures which contain them are subject to hydrolysis in the boiling dyebath, giving a bluer tone which is much more fugitive to light than the original. Other acid reds exhibit a marked loss of depth of colour on boiling, but the resulting dyeings show no loss in fastness to light. This hydrolysis takes place to an appreciable degree if the bath is allowed to boil for any length of time before the yarn is entered. After entry of the yarn, hydrolysis is much slower and is probably governed by the quantity of unexhausted dye in the dyebath. So long as the dyebath is not allowed to boil for an excessive time before the yarn is ready for entering, the dyes recommended for carpet yarn dyeing are quite satisfactory.

The normal practice in hank dyeing is for the yarn to be weighed out in the grease, and the percentage yield is not constant. Different blends of nominally the same quality of carpet yarn show different depths of shade when the same percentages of dyes are applied. This means that exact recipes cannot be used, and it is necessary for the first amount of dye to be on the low side, i.e. to approach the matching from the light side.

It would seem from the previous remarks that the dyeing of carpet yarn should be classed as an art rather than a science, depending on the experience and the eye of the dyer for variations in shade. If all the yarn to be dyed reached the dyehouse in a perfect condition then this could probably be accepted as true. Unfortunately this is an ideal rather than a fact, and most of the troubles met in carpet yarn dyeing have their origin in the previous history of the material.

In the first place the selection of wools for the blend is of vital importance, since if the components are not compatible, uneven dyeings will inevitably result. Even a very thorough blending will not necessarily remove the possibility of this unevenness.

It is common practice in the woollen carpet trade to spin wool which is not perfectly clean. In order to open up the material and to remove mineral impurities, the wools composing the blend are thoroughly shaken. Very dirty wools are scoured. If this shaking is not thoroughly done, the dirt is liable to be spun into the yarn, and is then very difficult to remove in the yarn scouring. The dirt retains the spinning oil, and when the yarn is dyed dark patches are formed on the outside of the batch.

Therefore too much emphasis cannot be attached to the vital need for really efficient shaking, and this is more than ever important in the case of hair yarns, which are spun from a very low-grade material. The obvious answer to this particular problem would be the scouring of the whole blend. The tendency in the carpet trade is to follow this course, but much yarn is still being made from blends which are not perfectly clean.

The components of the blend are then thoroughly mixed. Any neglect in this operation will result in yarn of uneven composition, making it an impossibility to dye it level.

After blending, the intermediate operations before dyeing are oiling, spinning, doubling, hanking, and scouring.

Approx. 8% of a good oleine is added to the blend. This spinning oil should contain at least 70% saponifiables, so that the subsequent scouring should be an efficient operation.

The yarn is normally scoured in a continuous machine of four bowls, first two bowls for detergents and then two rinsing bowls. The two types of machine in common use are the brattice and the tape machine, opinions varying as to their respective merits.

At the start of the run, the scouring bowls are set with soap and alkali, and during the run alkali is added, enough soap being generated by reaction of these additions with the spinning oil to maintain the required level of detergent action. Periodically throughout the operation some of the liquor from the scouring bowl is run off to waste, but it is a fact that even liquors very dirty in appearance retain sufficient scouring power to render their running off a definite waste. The washing-off waters must be changed continuously, since the presence of large percentages of soap in the yarn may constitute as great a menace as the presence of excessive oil. It is advisable for a constant check to be kept on the efficiency of the scouring operation by Soxhlet extraction of scoured yarns, both from the point of view of making any necessary modifications in the process and also with the object of keeping the scourer "up to the mark".

Very dirty and hard-twist yarns, which are prepared for a "non-crush" type of carpet, are best scoured in a dolly-type machine using a technique based on the piece-scouring method, with the hanks linked into chains. After being scoured, the hanks are passed in the wet state to be dyed.

Although the bulk of yarn dyeing is done in hank form, a certain amount is processed in the form of warps, for the manufacture of plain carpets. The required length of yarn for the particular order is doubled on doubling bobbins and creeled. The yarn is drawn from the creel and made into a ball warp.

The ball warp is pulled off on to the tapes of a tape scouring machine, scoured in the normal way, and festooned on the sticks of a Hussong machine. After being dyed, the warp is pulled off the sticks, dried in a brattice dryer, and then beamed and woven. The whole of the lot is used up for one particular order. In hank dyeing, if by any chance the supply of yarn runs out before completion of the order, the dyer is set a well nigh impossible task in the dyeing of a matching lot. When a fault occurs as a patch in the warp, then this fault arises as a patch in the finished piece, and may not be easily noticeable. A heavily dyed hank would appear as a line running through the piece and render it unsaleable as a perfect article.

The advantages of the warp-dyeing method are—

(1) It ensures that the correct amount of yarn is processed for the order.

(2) It eliminates hanking and hank winding together with the knots and waste which arise in these processes.

(3) The warp being one package precludes the possibility of yarn mixing, of which there is always a danger when hanks are being processed.

Should a stripe occur in the finished goods, it will be obvious that the fault cannot have arisen in the dyeing process. This does not, of course, apply in the case of hank-dyed yarns, where the dyer may be held responsible for stripy goods made from faulty yarn.

An alternative method of carpet-yarn dyeing consists in dyeing in cheese form. The merits of this method are the ease of making the package, the ease of winding from it, and the subsequent cutting down of waste, compared with the more difficult hank form. In the case of fine counts, winding costs can be high and the saving may be considerable. The counts of carpet yarns, however, are low, and it is difficult to see any great advantage in this case. A big drawback of the method is encountered in the scouring of such packages. With cotton yarns no scouring is needed, whilst in the case of worsted yarns only a small amount of oil is present, and this can be removed, with some difficulty, by the use of synthetic detergents. Probably more spinning oil will have to be removed from woollen yarn, and this must be carried out without the aid of the vital squeezing action. Also, while the drying of hanks is an easy matter, the drying of a large cheese of yarn is a vastly different proposition, the finished carpet resulting from yarns processed in this way being thready and without the desirable well covered appearance. Thus, although the advantages of cheese dyeing make it really attractive in the cases of cotton and fine-count worsted yarns, in our opinion the possibility of this method being adopted on a large scale for carpet yarns is remote.

The important loose-wool dyeing method may now be considered. Very dirty wool may be used in the blends, since the whole must be scoured before dyeing. The need for efficient shaking is still present, to remove loose dirt and to open up the wool.

The scouring is carried out in the normal loose-wool scouring machine in batches of about 600 lb. Since any unlevelness can be remedied in the subsequent blending, it is possible to use the acid milling and chrome dyes, to give a degree of fastness to light and to wet treatments which cannot normally be obtained in yarn dyeing. Since it is impossible to obtain an accurate idea of the eventual shade which will be produced in yarn by an examination of a sample of dyed loose wool, the batches are dyed according to recipe. A sample is carded and spun, and adjustments are made to the recipe for subsequent batches to arrive at a final matching. The risk of damaging the wool by prolonged boiling is therefore largely removed, a danger which is always present in the matching of a difficult shade in yarn dyeing. The final matching is carried out by sample blending, and the whole is very thoroughly blended. It is an unfortunate fact that, since the stimulus of the visual factor is lacking in the blending of undyed wool for hank dyeing, the same thoroughness is not always applied, although the necessity is obviously the same. There is no upper limit to the weight of a blend which may be produced to a particular shade. A drawback of the method is the fact that the time lapse between ordering and delivery of the dyed yarn may be quite considerable, and large stocks must be carried. After spinning, the yarn must be hanked or warped before scouring.

This loose-wool dyeing method, besides offering the advantages of better fastness, also produces a carpet with a fuller appearance. This is because the yarn is not set in the thread, so the tufts can burst more, giving a well covered appearance to the goods, which is often considered desirable.

A further advantage offered by the loose-wool dyeing method is in the preparation of marl yarns, i.e. folded yarns composed of single threads of different colours. If such a yarn is made from hank-dyed materials, then the single yarns must be wound for doubling, and the fact that the single yarns are weak causes difficulty during the winding process. Further, the fact that the yarn is set in a single thread in the boiling dyebath leads to splitting of the final folded yarn, giving rise to trouble during weaving.

When, however, loose-wool-dyed yarns are doubled from the mule cop, and subsequently scoured, the doubled yarn is set in that state, the single threads becoming more closely associated. By this method, therefore, winding costs are saved, and the troubles due to the splitting of the yarns are largely avoided.

It is felt also that the loose-stock dyeing method gives the best results in the production of mixed-fibre yarns. Accurate matching of shades on viscose rayon–wool yarns by hank dyeing is very difficult, and much better fastness can be obtained by blending after dyeing. In the case of wool–acetate rayon yarns it is still more important, and is probably the only satisfactory way of obtaining dark shades fast to rubbing.

Very little piece dyeing is carried out in the carpet trade for various reasons. The boardy nature of carpet pieces is opposed to the close packing of the goods in the piece cistern, so that the quantity dyed in one batch is limited. The tentering of the dyed pieces to width is made very

difficult by the absence of lists. The pile of the carpet is also liable to be mauled, resulting in shading, and the finished carpet would have an unattractive appearance. It is difficult to see what advantages this method could offer over warp dyeing, where the backing yarns are not present.

Printing, which was formerly very widely used in the production of tapestry carpets, has now lost its importance in the face of the advent of the Axminster process.

FAULTS

A survey of the more common faults met in the dyeing of carpet materials will underline the assertion that in general the faults originate in the previous history of the yarns. It has been said that the dyer acts as an indicator, irregularities due to the presence of impurities or chemical changes in the wool becoming visible during his work, and it is felt that this is very true in the case of the carpet yarn dyer.

The first source of trouble, already mentioned, is the lack of thoroughness in the shaking of the wool. The presence of dust in the scoured yarn would be first indicated by a high Soxhlet figure, because of the associated oil or grease; uneven dyeing would result, usually showing as dark patches on the outside of the dyed batches, and eventually as a dark place in the finished carpet. The method of avoidance of this fault is of course obvious and should constitute normal practice.

Secondly, a fault which may result in a large number of spoiled pieces, the origin of which may not be immediately obvious, occurs in cases where the yarn is irregular in composition. This is due to bad blending, where portions of the blend contain greater proportions of one constituent than do others. The difference may be of various types. Firstly the average fibre diameter. Considering two yarns where, other things being equal, one yarn contains a greater proportion of fine-diameter fibres than the other, then that yarn on dyeing will appear to be darker. A fibre analysis will reveal the causes of this fault.

Another difference, having a similar effect, lies in the degree of exposure of the constituent fibres. A yarn containing a larger proportion of damaged fibres than the bulk will have modified dyeing properties. An application of the method of Townend [3], which was used in connection with chlorinated and unchlorinated wools, is often of service in the determination of this fault.

Carpet yarn blends often have East India wools as a constituent. These have been grown under a tropical sun, and will dye to a lighter shade than wools grown in a more temperate climate when dyed under similar conditions. An excess of the modified fibres in a particular end in the finished piece will therefore show up as a light stripe.

If a sample containing these light and dark rows of tufts is stripped of dye, and redyed with a resist using a mixture of a disulphonated dye such as Solway Blue BS (ICI) and a monosulphonated dye such as Lissamine Fast Yellow AES (ICI), the originally lighter portion, i.e. that containing a larger proportion of damaged fibres, will be dyed bluer than the darker portion. In this way the fault is magnified to such an extent that the origin is unmistakable.

A method for use where only a small sample is available is to remove the tufts from the light and dark stripes and sew a sample of each into cotton gauze bags, stripping and redyeing being carried out in these packages.

Lack of uniformity in drying, particularly in the case of scoured wool-dyed yarn, may also give rise to a fault of similar appearance. In an overdried sample the yarn is set to a higher degree, with the result that the tufts of this yarn in the carpet will not be burst to the same degree as the tufts from a normal or underdried yarn, and will appear darker than the bulk.

The cleaning of the material for a carpet occurs at a very early stage in its manufacture; in other words, a good many operations are carried out after the scouring of the yarn, before the goods are ready for sale. These include the winding of the yarn on to bobbins, weaving, and the various finishing processes. In the manufacture of goods where the piece is scoured as such, any oil or dirt which may become associated with it in its previous history may be removed at this stage. In a carpet, however, this is not possible. It follows from this that great care must be exercised during the various processes to avoid soiling. If, however, the carpet becomes contaminated with lubricating oil spots from the machines, it is sometimes difficult to notice the fault before the carpet is sold. Such a mark in the carpet, where oil is present, would gather dirt in service and would quickly become apparent. It may happen, in fact, that inefficient scouring may be blamed, but the appearance of the spot under ultraviolet radiation, to the experienced eye, can help in distinguishing between mineral oil and oleine.

The presence of lime soaps following the use of slipe wools has been advanced as a cause of uneven dyeing, but we have not come across a case where this has been proved. As already stated, if an efficient shaking is given to the material, the remaining lime, in our opinion, will not give rise to any trouble in subsequent processing. There have, in fact, been several methods suggested for facilitating the level dyeing of carpet yarns, but the fact remains that a great deal of properly prepared carpet yarn was dyed level before the introduction of auxiliary products. Any product which improves the level-dyeing qualities of carpet yarn must be exactly 100% efficient to be of value, and it is much better to locate the fault and rectify it than to attempt to dye faulty yarns level.

Another apparent dyeing fault which may arise either during finishing or in wear is that due to what is termed *shading*, i.e. the occurrence of light and dark regions owing to the optical effects produced by the different reflection of light from the end of a tuft and from the side. The pile in areas where the carpet has been subjected to large pressure, or heavier traffic, will be flattened to some extent.

A reference was made on p. 155 to the necessity for rapid matching to shade on carpet yarns. When yarn is subjected to unduly prolonged dyeing, it becomes tender, and if woven into a design with

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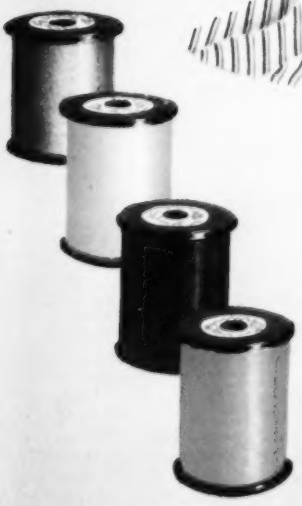

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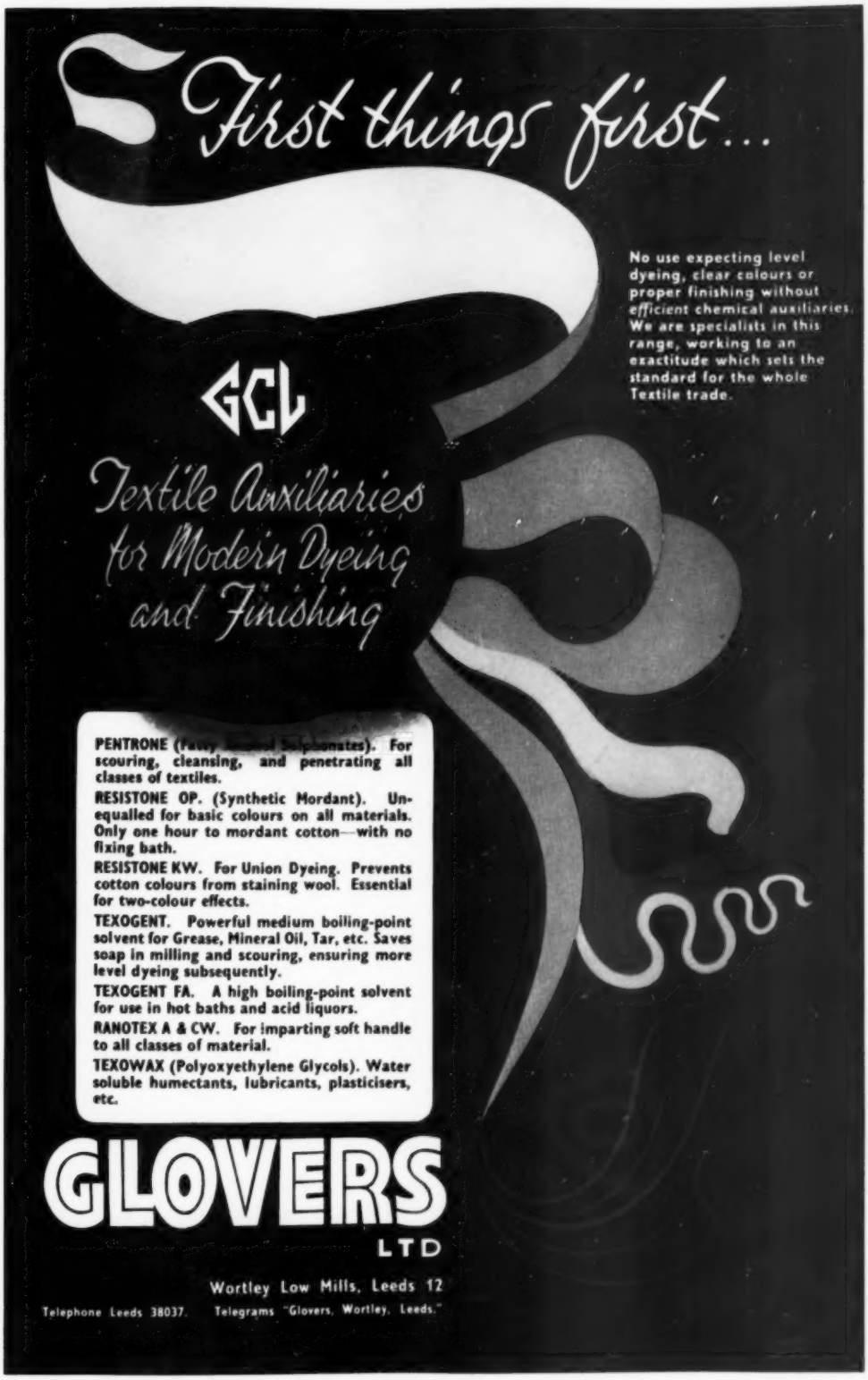
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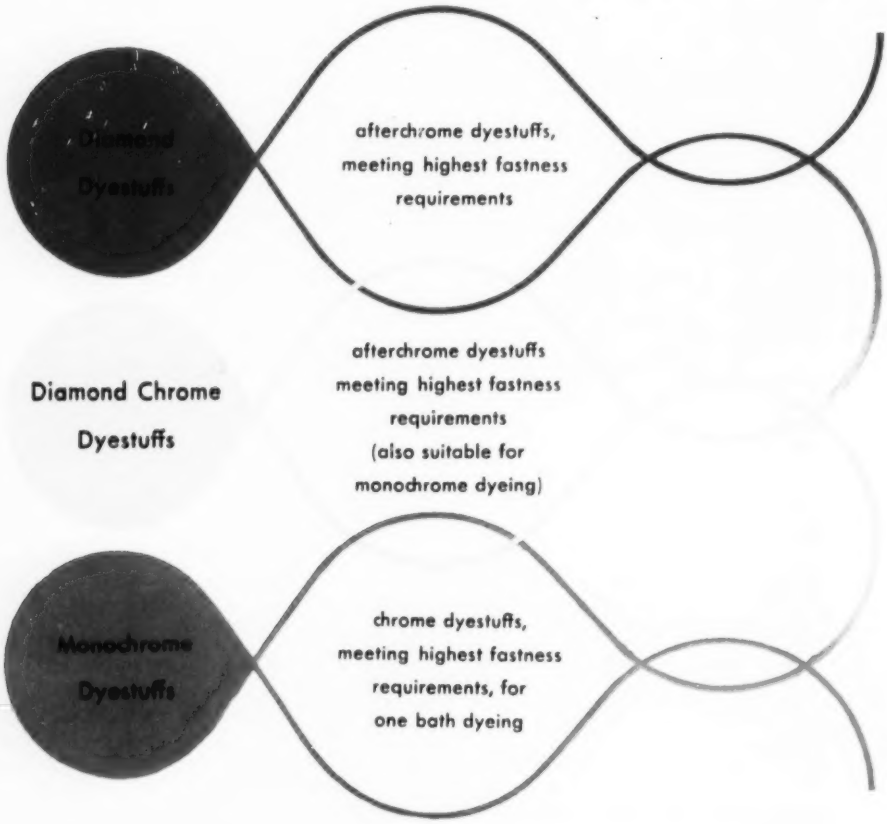
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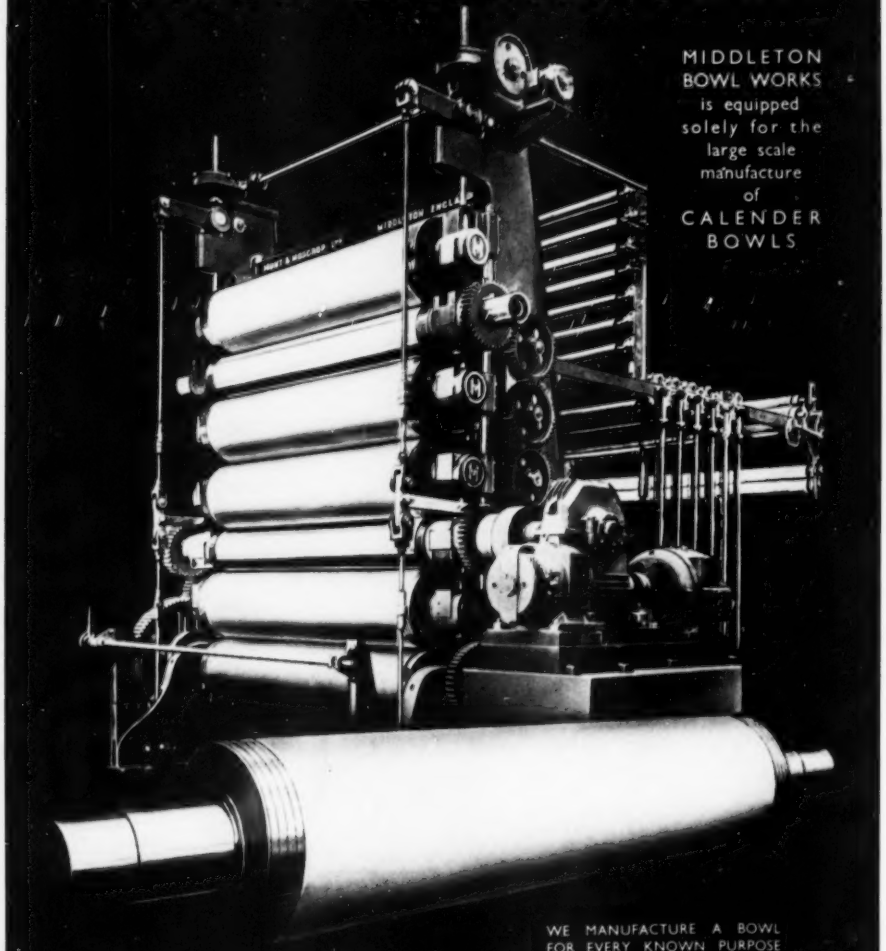

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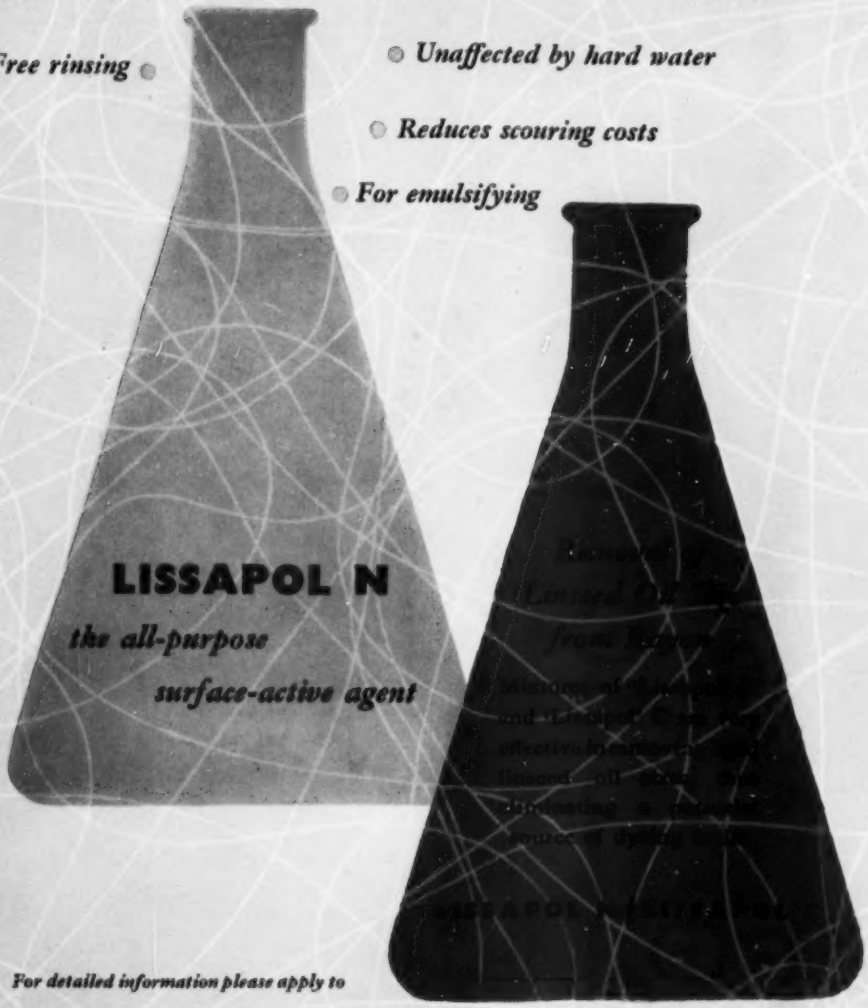

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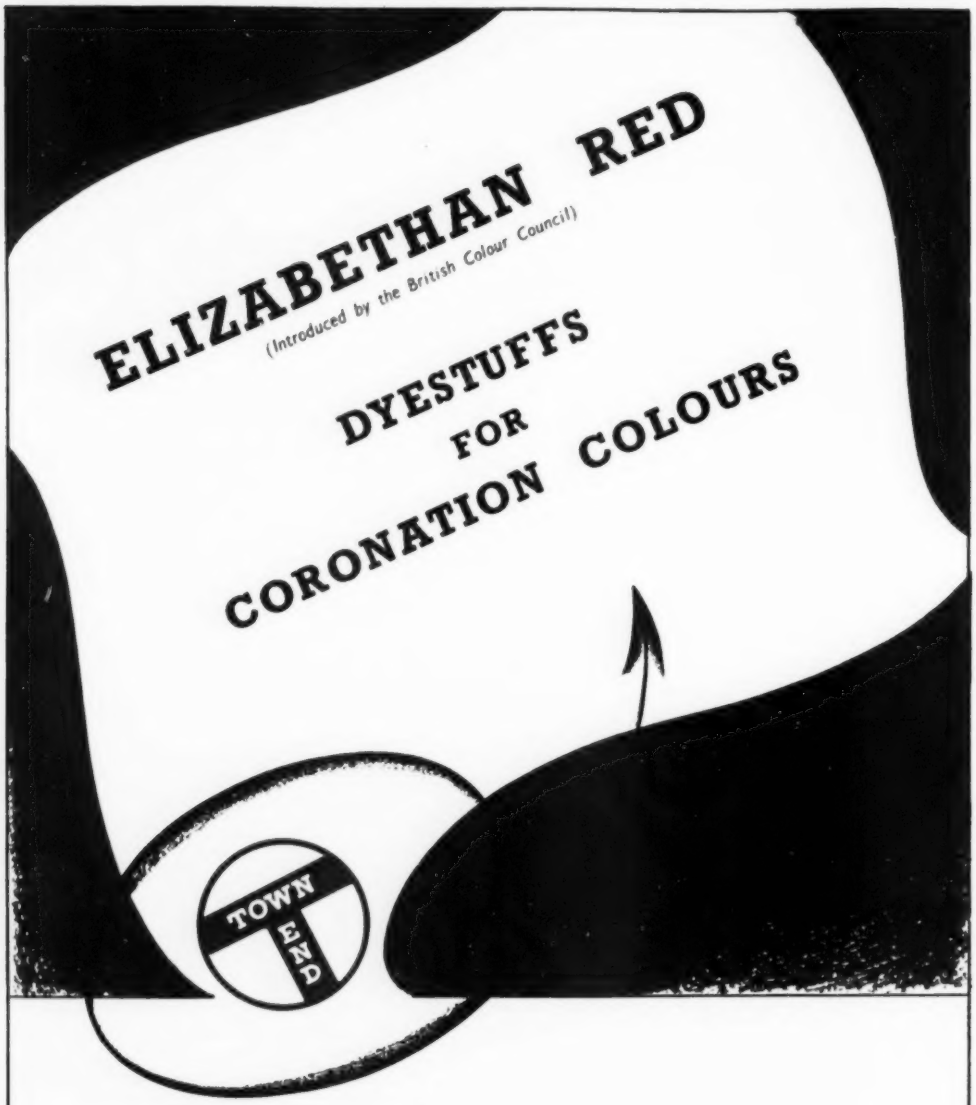


TOWN END CHEMICAL WORKS LTD

Bramley Leeds

*

normal yarn will reveal itself by premature wear. If tested for alkali solubility, such yarn will show a high figure.

It has already been mentioned that the main fastness requirement is to light. It is normally possible to attain a fastness of 5 to 6 on the scale of *B.S.* 1006, and any great improvement on this figure is not generally possible for the reasons indicated previously. It should be borne in mind that, when the *B.S.* 1006 standard patterns are exposed in a south window during a normal British summer, then standard 6 will fade, and that most acid-dyed shades will fade under these conditions.

Fastness to water and fastness to washing are not as important in the carpet trade as fastness to light, but nevertheless the highest possible standards are naturally sought.

Not many dyed shades on wool will stand up under the stringent test applied by plaiting the yarn with white wool, thoroughly wetting out, and allowing to remain wet for several days. A finisher dealing with a piece of cloth which has a design composed of several bright shades containing dyeings which are considered fast to milling and normal wet processing would not leave the piece lying about in a wet condition for any length of time.

When a thick cloth like a carpet is sodden with water on the floor, drying will take a considerable time. Should a carpet be wetted, it should be dried with cloths, lifted from the floor, and if possible dried with an electric radiator; then no bleeding of the colours will usually occur. If these normal precautions are not taken, then even with the best dyes possible some bleeding will result.

The use of detergents on carpets calls for great care. If the carpet is in a very soiled condition, it is always advisable to send it to a cleaner, who has the necessary plant to remove the dirt, the skill to remove the stains, and the means to dry a thick heavy cloth in the minimum time. Local dirt can often be removed by the use of solvents. A favourite method is the application of a mixture of fullers' earth and trichloroethylene in the form of a thick paste. The greasy dirt will become associated during drying with the fullers' earth, and the dust may be removed with a vacuum cleaner.

Carpets which are slightly soiled may be freshened up by the judicious use of synthetic detergents. Several good detergents are available to the public, and if the instructions are carefully followed good results can be obtained.

Unfortunately various strongly alkaline detergents are also marketed, and their lavish use on carpets can have disastrous results. Carpet yarns usually contain 1–1½% of acid, and this is capable of dealing with a considerable amount of alkaline detergent, if the detergent is applied in small quantities and with care. If, however, it is carelessly applied, bleeding may occur, and the pile will be made sticky and liable to collect soil.

It must be remembered that cleaning a carpet means removal of the soiling. What often happens in practice is that dirt is merely transferred from the face of the carpet into the base of the tufts, with very little overall improvement.

* * *

As will be appreciated, this paper has not attempted to deal with any deeply scientific problems, but rather to present an outline of the problems which have been experienced in normal day-to-day work.

We should like to express our thanks to the directors of Messrs. T. F. Firth & Sons Ltd. for permission to prepare and present this paper.

(*MS. received 20th December 1952*)

References

[1] Ashcroft, A. G., *J. Textile Inst.*, **42**, P 816 (1951).
[2] Angus, G. B., *ibid.*, **41**, P 271 (1950).
[3] Townend, F., J.S.D.C., **61**, 144 (1945).

Notes

Proceedings of the Council

At a meeting of the Council held at the offices of the Society, 19 Piccadilly, Bradford, on 15th April 1953, the proceedings included the following items of interest—

Election of Chairman— Mr. F. L. Goodall (*President of the Society*) was elected Chairman of the Council for 1953–54.

New Members of Council— The President extended a cordial welcome to new members of the Council (cf. J.S.D.C., **69**, 145 (May 1953)). It was reported that Mr. J. Montgomery (*Chairman, Northern Ireland Section*) had recently become a member of the Council *ex officio*.

Election of Vice-chairman— Mr. G. M. Williams was elected Vice-chairman of the Council for 1953–54

B.S.I. Textile Divisional Council— It was reported that Dr. H. A. Thomas had accepted an invitation to represent the Society on the Textile Divisional Council of the British Standards Institution, in succession to Mr. J. Boulton.

Finance Committee— Mr. N. Hamer and Mr. Fred Smith accepted an invitation to serve on the Finance Committee.

Membership of Committees of the Society— The membership of non-technical committees was reviewed. The resignation of Mr. J. A. Wallwork from the Terms and Definitions Committee, for health reasons, was accepted with regret, and the retirement of Dr. P. W. Cunliffe in order of seniority from the Dyers' Company's Medal Committee was noted.

Honorary Patent Agent— It was resolved to invite Mr. L. E. Jones to serve as Honorary Patent Agent for the ensuing year.

Representation on External Bodies— The representation of the Society on external bodies was reviewed for the ensuing year.

MEMBERSHIP— Twenty-five applications for ordinary membership and five for junior membership were approved.

Meetings of Council and Committees
April

Council— 15th
Finance— 23rd
Publications— 21st
Colour Index Editorial Panel— 1st
Terms and Definitions— 9th
Section Officers— 11th

The Second Edition of the *Colour Index*

The Society of Dyers and Colourists and the American Association of Textile Chemists and Colorists have announced that the Second Edition of the *Colour Index* will be published in 1955. The work has been completely redesigned and brought up to date with the co-operation of all the leading dye manufacturers in Great Britain, America, Western Europe, India, and Japan. The Second Edition will be in three main parts—

Part I (in three volumes each of approx. 1000 pages) will deal with all commercially homogeneous dyes and pigments in current use (approx. 5,000 dye entities and 25,000 commercial names) within groups relating to their main usage method. The data will comprise the commercial name and manufacturer's initials, methods of application, fastness properties, established usages, reactions on the fibre, and literature references relating to application. Each usage group is subdivided into hue groups by reference to a Hue Indication Chart designed specially for the purpose.

Part II (one volume of approx. 700 pages) will contain data relating to chemical constitution, method of preparation, patent and literature references relating to manufacture or constitution, solubilities, and reactions in substance for approx. 3800 dyes and pigments. The first edition recorded 1316 constitutions, and this very big increase is partly due to the fact that many co-operating dye manufacturers have, for the first time, disclosed the constitutions of certain of their dyes.

Part III (one volume of approx. 400 pages) will contain the general index. The Commercial Names Index will include the names of dyes not in current use, and the names of dyes now disclosed by the manufacturers as standardised mixtures.

The Society will be greatly helped in this major undertaking by an indication of the immediate demand, and for this reason has fixed a special prepublication price of £30 for the complete work, payable before 30th June 1953. There is also a scheme for three annual payments of £11. The price on publication in 1955 will not be less than £35.

A special order form will be found in this issue, on p. v of the advertisements section.

A descriptive leaflet and order form will gladly be sent on application to the Society of Dyers and Colourists, 19 Piccadilly, Bradford, Yorkshire, England.

These rates do *not* apply to the U.S.A. and non-British territories of Central and South America; information on rates of payment applicable to these areas can be obtained from the American Association of Textile Chemists and Colorists, Lowell Textile Institute, Lowell, Mass., U.S.A.

Science, Industry, and Society

An extremely interesting and thought-provoking address under the above title was given by the Right Honourable the Earl of Halsbury (Principal Guest at the Society's Annual Dinner this year — see p. 146) to the Society of Chemical Industry in November 1952 and has been reprinted in the issue of *Chemistry and Industry* dated 2nd May 1953 (pp. 416–420). Lord Halsbury was particularly concerned with the problem of overcoming the innate conservatism of human nature and discontinuing unprofitable research projects, out-of-date processes, and uneconomic industries.

Exhibition of Rayon Dyeing and Finishing Manchester, 16–30th June 1953

The exhibition recently held in London will be repeated at the Manchester College of Technology, as it is thought that it will interest not only garment makers and converters but also technical students. Further information can be obtained from the Rayon Dyers' Groups, 2 Cooper Street, Manchester 2, or the British Rayon and Synthetic Fibres Federation, 58 Whitworth Street, Manchester 1.

Survey of Structural Types in Polypeptide Molecules

An appeal has been made for specimens which would enable such a survey to be carried out by the X-ray scattering method. The subject is discussed in an article in *Nature* (**171**, 144–145 (24th Jan. 1953)), and workers who would like to contribute specimens are invited in the first instance to write to Dr. D. P. Riley and Dr. U. W. Arndt, Royal Institution, 21 Albemarle Street, London W.1, giving details (cf. p. 177).

The Dyers of Linlithgow[1]

The Marches of Linlithgow were first ordered to be ridden in 1541, and it is on record that the Deacon of the Cloth-walkers or Fullers and Cloth-finishers, who were also of necessity litsters or dyers, was among those commanded to attend "my Lord Provost, Bailies and Council for the purpose of riding the Town's Marches and Liberties".

Cloth-walking was a flourishing trade in Linlithgow in those early days, and two place-names in the neighbourhood bear testimony to this. There is Waukmilton, and a part of the loch at the Duke's Entry is still known as Pandy— a pandy being a place for steeping cloth.

Those engaged in the trade instituted a friendly society, the revenue of which was derived from contributions from the cloth-walkers. In course of time the funds accumulated, and the society was able to lend out sums of money on bond to local burgesses and others.

In 1638 the Incorporation of Cloth-walkers became extinct, but the dyeing department

continued to flourish, and the incorporation thereafter became known as the Fraternity of Dyers. As time went on, the dyeing trade also disappeared from Linlithgow, but the old friendly society continued as a vigorous institution.

There have been many challengers to Linlithgow's claim to possess the oldest friendly society, but it has been ascertained from an examination of records that the Fraternity of Dyers in Linlithgow was the first friendly society to be registered in Scotland. The next in seniority was the Incorporation of Carters in Leith, a society which was founded in 1555.

[1] *Linlithgowshire Journal and Gazette* (13 March 1953).

New Books and Publications

Textile Printing

Materials, Methods, and Formulæ

By F. F. Jacobs. Pp. ix + 219. New York: Chartwell House Inc. 1952. Price, $5.00.

The preface of this publication stresses the need for a compact book dealing with textile printing, and most certainly this need exists. Differences of opinion will, however, arise as to what matter should be included and what rejected to enable the author to reach his goal of compactness. In endeavouring to achieve this object, the author has confined his attention to giving numerous recipes at the expense of giving any real explanation of what are the functions of the ingredients of those recipes. For students and junior members of printworks staffs, for whom the book is stated to be written, it seems that this latter feature is the more important.

It seems unnecessary to quote both percentages and parts per 1000, or parts per gal. and per 12 gal. (U.S.A.). All conversions from weight to volume appear to be made on a common basis irrespective of the specific gravities of the liquids, and, as these range from water to zinc oxide pastes, the errors introduced can scarcely be regarded as negligible.

The book is admittedly based solely on American practice, but no attempt seems to have been made to confirm the importance of certain features, perhaps strange to that market. Thus the author seems to suggest that styles based on Para Red were never of any importance, or even never were.

Unfortunately the book appears to have been carelessly compiled and contains such an unduly large number of errors, contradictions, and misstatements that the student cannot have confidence in those portions of the book not subject to obvious errors.

H. B. Briggs

Textile Chemicals and Auxiliaries

Edited by H. C. Speel. Pp. v + 493. New York: Reinhold Publishing Corpn. 1952. Price, 80s. 0d.

During the past thirty years or so the textile industry has become increasingly chemical, and certain sections of it are rightly described as branches of applied chemistry. Many of the reagents employed are not discussed in standard textbooks and are not pure substances. They belong to that group of materials, now termed "auxiliaries", which embraces several thousand reagents, all of which find some use in the industry. To discuss fully the subject "Textile Chemicals and Auxiliaries" therefore requires consideration of these substances. The present book is the result of an attempt to provide information on all reagents used in textile processing and on the processes in which they are used. The work has been carried out by a team of American experts most of whom are associated with commercial organisations and should therefore have close contact with the trade. The book is divided into two parts, one dealing with the nature and processing of fabrics and the other with the reagents used in fabric processing. With the adoption of such a plan some overlap inevitably occurs. Part I is a general introduction to the chemical aspects of textiles and includes chapters on the chemical and physical nature of fibres, the preparation of fibres and fabrics, textile dyeing and printing, the technology of pigment application, textile finishing, fabric stabilisation, and coated fabrics. The treatment of the various topics is generally superficial and often elementary, although it must be conceded that no claim is made to deal fully with the many subjects considered. Stress is laid on the purely chemical aspects, but in the first three chapters too much ground has to be covered for the account to be satisfactory. The essay on Textile Finishing (Chapter 5) is, however, a particularly worthy contribution.

In Part II many of the topics mentioned in Part I are discussed in greater detail. Since water is the most important "chemical" used in textiles an essay on this substance is included, while other chapters deal with well established reagents such as fats, oils and waxes, solvents, sulphated fats and oils, soaps, starches, gums, and glues. A general discussion of surfactants or surface-active agents is followed by detailed consideration of anionic, non-ionic, and cationic finishing agents, and finally there are essays on synthetic resins, cellulose finishes, water-resistant treatments, flameproofing, and mothproofing.

The scope of the volume is therefore unusually wide, and this is bound to give rise to criticism. So much depends on the purpose of the work. The author in his preface claims that it is "to cover as much of the textile field as possible . . . . pointing out the chemicals and chemistry that have played such an important part in this industrial revolution". It is impossible to do this adequately in a volume of 493 pages, although the book lists and references to original papers do help to remedy omissions. As would be expected, the auxiliaries mentioned are mainly American, but the work would have been of much greater value to English readers if some indication had been given of their

manufacturers. Only in one chapter is the sound practice adopted of giving the manufacturer's name in brackets after the name of the reagent, e.g. Rectifiol (New Chemicals). This could still be easily remedied in a second edition by providing an appendix in which such information is given. It is not to be expected that all the chapters will be of the same standard, but on the whole, considering the difficulties of the task, all authors have made valuable contributions, and the volume will be a useful reference book to those concerned with the chemical aspects of textiles. C. S. WHEWELL

Manufacturers' Publications and Pattern Cards

The Society does not accept any responsibility with regard to the statements in the following notes. Any publication abstracted may be referred to by members of the Society on application to Dr. C. B. Stevens, Dyeing Department, Leeds University

British Celanese Ltd.

THE AVOIDANCE OF GAS FADING ON ACETATE— Four Technical Bulletins have been issued under this general title—

GF 1. *General Considerations*— This outlines the causes and incidence of gas-fume fading and summarises the principal recommendations for minimising this defect.

GF 2. *Notes for Dyers and Finishers*— This discusses dye selection; protective coatings, including (*a*) inhibitors which combine with oxides of nitrogen and (*b*) substances which form protective barrier coatings; and precautions to be observed in normal finishing treatments. An appendix contains a comprehensive selection of disperse dyes classified into three groups according to their fastness to gas-fume fading.

GF 3. *Notes for Warehousemen and Garment Makers*— This contains recommendations concerning storage conditions and precautions to be followed in the making-up room to lessen the possibility of gas-fume fading.

GF 4. *Testing Dyed Materials for Resistance to Gas Fading*— This describes the apparatus, standard dyeings, reagents, procedure, and method of assessment used in a test method based on the provisional S.D.C. method (*J.S.D.C.*, **64**, 134 (1948)). It is emphasised that the test should be regarded as tentative, since further work is still proceeding in collaboration with the Society. Drawings and photographs of the apparatus are given in an appendix.

Brotherton & Co. Ltd.

ESTROCON— This pamphlet gives four typical recipes for applying chrome and acid dyes, the hydrolysable esters Estrocon ET and EL (diethyl tartrate and ethyl lactate respectively) being used as a means of controlling the pH of the dyebath during dyeing.

The Clayton Aniline Co. Ltd.

CHLORANTINE FAST YELLOW 2RLL— This Class B direct cotton dye gives reddish yellows on cellulosic fibres. It is recommended for furnishing and spun viscose rayon dress materials, since it withstands the normal crease-resist finishing processes. When wool–cotton mixtures are dyed, the cotton is dyed more deeply than the wool even at the boil. Acetate rayon is reserved. Fastness figures include— Light 6–7, washing 3–4, perspiration 3.

DIRECT FAST SCARLET 8BA— This Class B direct cotton dye gives bright bluish reds and is recommended for dyeing all forms of cellulosic material, in particular spun rayon dress fabrics, since dyeings are unaffected by normal crease-resist finishing. Acetate rayon is slightly stained and dyeings are not dischargeable. Wool is virtually undyed at low temperatures, particularly in the presence of Albatex WSE. Fastness figures include— Light 3, washing 3, perspiration 3–4.

Imperial Chemical Industries Ltd.

ICYL SKY BLUE G— This direct cotton dye is an addition to the range of dyes characterised by their ability to produce solid dyeings on viscose rayon of irregular quality. It is recommended for producing blues having a brightness and greenness not obtainable with other members of the range, and it is of interest for dyeing all types of cellulosic material where level dyeing is a main consideration. It is suitable for dyeing unweighted silk and may be discharged to white by means of alkaline Formosul. Fastness figures on viscose rayon include— Light 3, washing (once at 40°c.) 3–4, perspiration 2.

POLYMON BLUE GS— This pigment is a modified form of Monastral Fast Blue G, and is specially designed and controlled for colouring plastic moulding powders. While retaining the excellent fastness properties of the parent pigment, it is much more readily dispersed, being superior in this respect to Fast Turquoise Blue 21035. It is slightly greener, more transparent, and stronger than the latter, is non-migrating and non-bleeding from plastics, and has good heat stability.

LISSAPOL NC— This is a liquid mixture of anionic and non-ionic detergents, stable to acids, alkalis, and neutral electrolytes and readily soluble in cold or hot water. Purposes for which it is particularly suitable include the aftertreatment of azoic dyeings and prints and the scouring of natural and man-made fibres prior to dyeing.

COOMASSIE RED BR— This acid dye is recommended for producing bright reds of good wet fastness on loose wool and slubbing. It has good affinity in neutral dyebaths, dyes well by the Carbolan Salt A process, and is unaffected by chrome or formaldehyde in the dyebath, thus being suitable for dyeing chrome-stripped rags, shading mordant dyes, and dyeing wool–Ardil mixtures. It is of interest for dyeing nylon from an acid bath and for producing pale to medium solid dyeings on wool–nylon mixtures. Fastness figures on wool include— Light 4, carbonising 5, alkaline milling 4.

FD CALEDON RED 4B POWDER FINE— This vat dye is recommended for application to all types of cellulosic fibres to give bluish reds of excellent fastness. It is of particular interest on yarns where good fastness to cross-dyeing, mercerising, cellulose ester bonding, and soda boil–hypochlorite bleaching is required. The recommended dyeing method is No. 2 at 50°c., but it is also very suitable for pigment padding and leuco vat dyeing. It is not suitable for use on silk or nylon and is of no interest for textile printing. Fastness figures on cotton include— Light 6–7, hypochlorite 4–5, soda boiling 4.

Sandoz Products Ltd.

THE PRINTOFIX PROCESS— This is a pigment-printing method employing Printofix colours in conjunction with Printofix PD as fixing agent and Sandol Emulsion PD and Cerol WB as softeners. The only fixing treatment required is drying on cans or a short treatment in a drying chamber at 105–110°c. This gives adequate fixation to ensure good fastness to washing; no steaming, washing, or soaping is required. The process is applicable to all textile fibres and also to glass fabrics and leather; roller machine, screen, and padding techniques may be used, and direct, discharge, and reserve styles may be produced. Direct prints of twelve Printofix colours are shown, together with fastness data on cotton and full details of methods of application.

CHLORAMINE FAST SCARLET 8BS— This is a Class B direct cotton dye, rather more level dyeing than the yellower 4BS brand. It is particularly recommended for dyeing cellulosic materials which are subsequently to be crease-resisted by the urea–formaldehyde method, since the fastness to light of the dyeing is increased thereby. Fastness figures include— Light 3, washing at 40°c. 3, perspiration 3.

CUPROFIX RED–VIOLET CBL: RESOFIX RED–VIOLET CBL— This direct cotton dye gives reddish violets similar to those given by Solar Rubinole FBL when aftertreated with either copper sulphate, Cuprofix S new, or Resofix CU, the wet fastness of the dyeings increasing in that

order. It has good affinity at low temperature, is level dyeing, and gives good results on "barry" viscose rayon. Dyeings are dischargeable to a white by the Cuprofix White Discharge recipe. Fastness figures of a dyeing on cotton aftertreated with Resofix CU include— Light 6–7, washing (medium dyeing at 80°c.) 4–5, perspiration 4–5.

CUPROFIX RED C8BL— This direct cotton dye gives on cellulosic fibre bright bluish reds having good fastness to light and wet treatments when aftertreated on the fibre with copper sulphate or Cuprofix S new. Solid dyeings may be obtained on viscose rayon–cotton mixtures; acetate rayon is reserved when medium shades are dyed below 80–85°c. Wool is dyed much less deeply than cotton in wool–cotton mixtures. Dyeings can be discharged to a white by the Cuprofix White Discharge recipe. Fastness figures of a dyeing on cotton aftertreated with copper sulphate include— Light 6, washing (medium dyeing at 60°c.) 3, perspiration 4–5.

LANASYN BROWN RL— This card describes the general dyeing characteristics and the properties of dyeings of a new range of dyes which includes Lanasyn Blue GL, Green BL, and Grey BL as well as Brown RL, which last is described in detail. These dyes are recommended for application under neutral dyebath conditions to wool, silk, and nylon and mixtures of these fibres to give very level dyeings of very good fastness to light and wet treatments. Dyeings on wool slubbing and yarn are shown of Brown RL alone and in mixture with Alizarin Light Brown BL and Lanasyn Grey BL, and also of a mixture of Lanasyn Grey BL and Lanasyn Blue GL. Two single and two mixture dyeings are included on 70 : 30 wool–nylon yarn and on 100% spun nylon yarn respectively, and two dyeings of Brown RL on silk cloth. The range of patterns is completed by screen prints of Lanasyn Brown RL on wool and silk. Fastness data are appended for dyeings on wool, silk, and nylon of all four dyes.

Abstracts from British and Foreign Journals and Patents

The titles of abstracts may be modified. Abbreviations of names of firms are listed in J.S.D.C., **68**, *23 (Jan. 1952), and also, together with symbols and the periodicals abstracted, in the annual index*

I— PLANT; MACHINERY; BUILDINGS

Unit Operations Review. *Ind. Eng. Chem.*, **45**, 15–98 (Jan. 1953).

Reviews of progress in absorption and humidification, adsorption, centrifugation, crystallisation, high-temperature distillation, high-vacuum distillation, drying, evaporation, solvent extraction, filtration, fluid dynamics, ion exchange, materials handling, mixing, and size reduction. C. J. W. H.

Heat Balance and Evaporation Figures for Drying Machines. R. Mulsow. *Melliand Textilber.*, **33**, 1117–1119 (Dec. 1952).

PATENTS

Furnace for producing Carbon Black. Godfrey L. Cabot. *USP* 2,606,819

Wet Processing of Yarn on a Thread-storing Thread-advancing Reel. Industrial Rayon Corpn. *BP* 688,219

Means for obtaining satisfactory treatment of the yarn and for minimising the adverse effects of high yarn speed and low yarn tension. C. O. C.

Tubes on which to Wind Yarn for Package Dyeing. Groeninghe Ververij P.V.B.A. *BP* 688,091

The tube has a perforated conical body, the larger end having an outwardly directed thickening so as to allow yarn to be wound on down to the end of the body. This larger end also has an inwardly directed annular flange to fit on to the smaller end of a second tube placed beneath it. This avoids use of special insets between each package. C. O. C.

Wet Processing of Textiles, Paper, etc. H. Muller. *BP* 687,970

The materials to be treated are passed continuously through the liquid, in which vibrations are generated by at least two submerged members, between which the materials can be passed. The members extend over the entire width of the material, and at least one of them is connected to a drive which sets it in vibration, so as to cause vigorous movement of the liquid on to and within the materials being treated. C. O. C.

Wet Processing of Open-width Fabric. W. Mycock. *BP* 686,973

In an open-width washer, dye jig, or the like, one or more of the bottom or upper rollers are oscillated about a pivot whose axis is parallel to that of the rollers and preferably in the same plane. This causes the fabric, as it passes from one upper roller to a bottom roller and back to the next upper roller, to move through the bath with a swinging movement, and thus increases the rate of penetration of the liquid into the fabric. C. O. C.

Continuous Open-width Treatment of Fabrics. Mezzera S.p.A. *BP* 688,007

The fabric is fed through the liquor while supported on sticks borne on two endless sprocket chains. The chains are such that the clearance in an axial direction is equal for all sticks. The plates on the inner sides of the chains have slots in which the stick ends fit, and the plates on the outer chain links have a projection on their inside. The tank has guides on each side to support the sticks, these guides having saw teeth or being otherwise shaped so as to cause the sticks during their displacement in the liquor to have a slow lifting motion followed by a rapid fall. This causes the folds of material to be displaced in the liquor in a direction other than horizontal. This considerably increases the efficiency of the treatment and reduces the period during which the fabric is in contact with the stick, thus avoiding stick marks on the fabric. C. O. C.

Winding Fabrics. BrC. *BP* 687,932

In winding a roll of fabric, e.g. on a dye jig, staggering the turns of fabric, so that the selvedge no longer builds up at one spot, eliminates distortion of the fabric. This staggering can be effected by running the fabric on to the roll over an expander bar which is reciprocated along its axis. C. O. C.

Nylon-preboarding Machine. Dexdale Hosiery Mills. *BP* 687,245

Nylon hose are preboarded in a pair of treatment chambers connected through a compartment fitted with a circulating fan for maintaining a common atmosphere. Opposite ends of the chambers are closed by retractable doors which pass over guideways immediately in front and extending on both sides of the mouths of the chambers. A pair of carriages serve each chamber, carrying the vertical metal hosiery forms and operating along the guideways. The operation enables one set of forms to be replenished whilst the opposite set is in the closed chamber. Each set of forms is automatically telescoped into a compact group before introduction into the chamber, and extends again on emerging to facilitate replenishment. G. E. K.

Screen Printing Machine. Roto-Matic Screen Printer. *BP* 688,194

Resin-impregnated and -coated Fabrics. Universal Moulded Products Corpn. *USP* 2,607,708

Apparatus which enables wider fabrics to be treated than has hitherto been possible. C. O. C.

Drum Washing, Dry-cleaning, and Dyeing Machines. Cherry Tree Machine Co. *BP* 688,076

One or both ends of the drum have a compartment separate from the work chamber. This compartment communicates with an external discharge (or supply) pipe by way of a hollow axial neck at the adjacent end of the drum. Radial or other webs divide this compartment into V-shaped pockets which communicate with the work chamber by way of perforated "lifters", these acting successively, as the drum rotates, to convey liquid from or to the work chambers through the hollow neck. C. O. C.

Laundry Marking Machine. National Marking Machine Co. *BP* 687,904

Paper-coating Machine. Paper Patents Co. *USP* 2,606,520

A machine particularly suitable for coating book papers. C. O. C.

Extrusion Coating Machine. Frank W. Egan & Co. *USP* 2,607,712

An improved machine of the type which uses rollers to bond a sheet of hot thermoplastic material to paper in a continuous operation under controlled pressure and temperature. C. O. C.

Alphabetical List of New Products developed since November 1951 (IV p. 165).
Bonded-fibre Fabrics (VI p. 170).
Barotor Pressurised Fabric-dyeing Machine (VIII p. 174).
High-frequency Drying in the Rayon Industry (X p. 175).

III—CHEMICALS; AUXILIARY PRODUCTS; FINISHING MATERIALS

Components of Wool Wax. I—Aliphatic Alcohols. J. Tiedt and E. V. Truter. *J.C.S.*, 4628–4630 (Dec. 1952).

The unsaponifiable fraction of wool wax is found to contain the five alcohols—*n*-octadecanol, *n*-eicosanol, *n*-docosanol, *n*-tetracosanol, and *n*-hexacosanol. No evidence could be obtained for the occurrence of normal alcohols higher than hexacosanol. H. H. H.

Constitution of the Hydroxy Acids of Wool Wax. D. H. S. Horn, F. W. Hougen, and E. von Rudloff. *Chem. and Ind.*, 106 (31 Jan. 1953).

The acidic fraction of wool wax is shown to contain nearly 30% of hydroxylated fatty acids, the major components of which have been characterised in two ways—(*a*) by separating the hydroxy acids from unhydroxylated acids, and resolving them into several components by the Craig solvent distribution method; and (*b*) by converting the total mixture of esterified acids to the corresponding alcohols with $LiAlH_4$, separating the dihydric and monohydric alcohols by chromatography on activated alumina, and resolving the mixed diols by fractional distillation of their acetates under reduced pressure. The products obtained are tabulated. J. W. B.

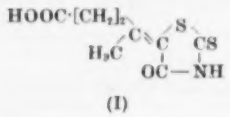
Wool Wax. III—Synthesis of some *iso*-Acids. F. W. Hougen. D. Ilse, D. A. Sutton, and J. P. de Villiers. *J.C.S.*, 98–102 (Jan. 1953).

Polymerisation of *N*-Vinylpyrrolidone in Solution. J. W. Breitenbach and A. Schmidt. *Sitzungsber. Österr. Akad. Wiss. IIb*, **161**, (8–9), 1288–1290 (1952).

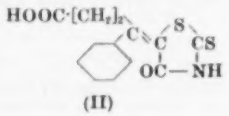
In presence of 2-azo*iso*butyronitrile a higher degree of polymerisation is obtained in aq. soln. than with *N*-vinylpyrrolidone alone. Dissolution in benzene has no such effect. In technical polymerisations with H_2O_2 products of much lower mol. wt. are obtained. H. E. N.

Condensation Products of Rhodanine and Keto Acids—Mildewproofing Agents. G. G. Allan, D. MacLean, and G. T. Newbold. *J.C.S.*, 5053–5054 (Dec. 1952).

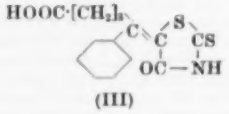
Rhodanine condenses with laevulic acid, β-benzoylpropionic acid, and γ-benzoylbutyric acid to give (I), (II), and (III) respectively, of which the two former exhibit mildew-prevention activity. The condensing agent is NH_2–NH_4Cl; no reaction occurs with CH_2·COONa–CH_2·COOH.



(I)



(II)



(III)

H. H. H.

Quaternary Ammonium Compounds with Bactericidal Properties. H. Sturm, E. Konermann, R. Aeschbacher, and R. Gradmann. *Ind. Eng. Chem.*, **45**, 186–188 (Jan. 1953).

Triethanolamine mononalkyl ethers, with alkyl groups $> C_{10}$, were prepared by the action of alkyl bromides on the monosodium compound of triethanolamine. The ethers are colourless oily liquids, or solids with a strong blue-violet fluorescence; they are insoluble in, but emulsify with, water. They are readily converted into quaternary ammonium compounds on being mixed with e.g. benzyl bromide. These are water-soluble surface-active compounds with strong bactericidal properties and low toxicity. W. K. R.

PATENTS

Wetting and Germicidal Agents. California Research Corpn. *BP* 688,757

Quaternary alkylphenylmethylammonium halides in which the alkylphenylmethyl group is directly attached to the quaternary N by the methyl C, the alkyl group being derived from a propylene polymer of 9–18 C, the three additional valences of the N atom being satisfied by hydrocarbon or hydroxyalkyl substituents together of < 13 C, and no substituent being of > 7 C, have good surface-active properties and are potent germicidal or fungicidal agents. C. O. C.

Alkarylsulphonate–Carboxymethyl Cellulose–Alkaline Salt Detergent Composition. Wyandotte Chemicals Corpn. *BP* 688,752 *BP* 688,754

The detersive action of sodium alkylarylsulphonates (Alk of 12 C; Ar of benzene series) is much increased by addition of sodium carboxymethyl cellulose, and addition to the mixture of an inorganic alkaline salt or builder increases this action still further. Such compositions are quite as satisfactory for laundering cotton fabrics as are soap-based compositions. C. O. C.

Silylphenoxyethyl Alcohols—Emulsifying Agents and Detergents. Dow Corning. *BP* 688,817–8

Compounds of formula $(CH_3)_3Si{\cdot}C_6H_4{\cdot}O{\cdot}CH_2{\cdot}CHR{\cdot}OH$ (R = H or CH_3) have emulsifying and detergent properties. C. O. C.

Aliphatic Ester–Amide Sulphonates—Auxiliary Agents. Procter & Gamble Co. *BP* 687,949

Compounds of formula $R{\cdot}CO{\cdot}O{\cdot}C_nH_{2n}{\cdot}CO{\cdot}NXY$ (R·CO = acyl group of sat. fatty acid; $n = 1$–5; X = H or Alk of 1–4 C; Y = Ar, aralkyl, or alkaryl of < 11 C) which are sulphonated in the aryl portion of the molecule have wetting and detergent properties which are unaffected by hard or salt water or by acids or alkalis. C. O. C.

Alkali-metal Carboxylates of Organosilicon Compounds—Detergents and Emulsifying Agents. British Thomson-Houston Co. *BP* 688,407–8

Compounds of formula—

$$(CH_3)_3Si{\cdot}[O{\cdot}Si(CH_3)_2]_n{\cdot}[CH_2]_m{\cdot}S{\cdot}CH_2{\cdot}COOM$$

($n = 0$, 1, or 2; $m = 2$ or 3; M = Li, Na, or K) have the same detergent properties as fatty acid soaps of the same mol. wt. C. O. C.

Starch Products. National Starch Products. *BP* 688,291

An ungelatinised starch derivative having improved water-absorptive powers and a lowered gelatinisation point, suitable for adhesives and textile fillers, is formed either by treating raw starch with chloromethylisethionic acid, an $\alpha\beta$-unsaturated olefinsulphonic acid, *p*-sulphobenzyl chloride, or a salt thereof in presence of alkali under conditions which avoid gelatinisation, e.g. after addition of Na_2SO_4, or by treating with sulphurous acid or a bisulphite an ethylenically unsaturated starch derivative $(C_6H_{10}O_5)_n{\cdot}C_6H_9O_4{\cdot}R^1{\cdot}CR^2{:}CR^3R^4$ (R^1 = O·CO, O·CO·CH_2, O·CH_2, or O·CH_2·O; if $R^3 = R^4 = H$, then R^2 = CHO, CN, COOH, COOAlk, or "carbalkyl" (first group); if R^3 or R^4 (or both) = CHO, CN, COOH, or unsubst. or subst. Alk or Ar (second group), then R^2 = H or radical of the second group). J. W. B.

Stabilised Rosin Size. Hercules Powder Co. *USP* 2,606,842

Sizes containing modified or unmodified natural resin are stabilised to deterioration by incorporation of an arylnitroparaffin; if desired paraffin oil may also be added. C. O. C.

Urea–Formaldehyde Resins containing less than Two Molecules of Formaldehyde per Molecule of Total Urea. Beck, Koller & Co. (England). *BP* 687,310

Urea (5 mol.) and a polyhydric alcohol (1–2 mol.) are heated to 170–180°c., and stirred until the melt has constant wt. It is then cooled to 140–150°c., $\geq$ 10 mol. of HCHO added at pH 3·0–3·5, and the solution refluxed for 10–30 min. The solution is finally adjusted to pH 7 or over. The product is of especial value as a textile finish, as the cured resin is less susceptible to water than those containing a larger proportion of formaldehyde and is less liable to cause obnoxious odours during curing. C. O. C.

Flame-resistant Finish. DuP. *USP* 2,607,729

A solid, dry, water-soluble product which imparts a flame-resistant finish to fibres, etc. which react chemically with it, e.g. acrylonitrile polymers containing reactive functional groups, is obtained by treating a dry mixture of titanium oxychloride and basic or normal antimony chloride (Sb : Ti ratio 0·5–2·0) with a very small quantity of water. The flame-resistant finish imparted is fast to washing and dry cleaning. C. O. C.

Flameproofing Agents. Glenn L. Martin Co. *BP* 688,372

The products obtained by incompletely polymerising a compound of formula $OP(OR)_2X$ (R = same or different unsat. radical of 3–5 C; X = same as one of the OR groups or NH_2) and then halogenating or *vice versa* are flameproofing agents which require no resinous binder. They can be used for imparting a flameproof finish which is fast to laundering and dry cleaning but does not affect the handle. C. O. C.

Polymerisable and Polymerised *iso*Cyanate Compositions. American Cyanamid Co. *USP* 2,606,892

A mixture of (i) a compound $CH_2{:}CR{\cdot}A_n{\cdot}CH_2{\cdot}NCO$ (R = H or CH_3; A = bivalent sat. alkylene or arylene, which may be substituted by Ar or Alk respectively; n = 0 or 1; the $CH_2{\cdot}NCO$ group is attached directly, when n = 1, to any C atom of A) and (ii) a compound containing a single $CH_2{:}C$ group and free from H or atoms reactive with the *iso*cyanate group is useful for treating textiles, e.g. for reducing the felting power of wool. C. O. C.

Film-forming Organosiloxane Compositions. Dow Corning. *BP* 686,575

A mixture of a benzene-soluble dimethylpolysiloxane high polymer and a liquid methyl hydrogen siloxane readily forms a tough, flexible, tack-free, water-repellent film on air drying. It is adherent to cellulosic surfaces and plastics. C. O. C.

Alphabetical List of New Products developed since November 1951 (IV below).

IV—RAW MATERIALS; INTERMEDIATES; COLOURING MATTERS

Alphabetical List of New Products developed since November 1951. Anon. *Amer. Dyestuff Rep.*, **41**, 795–838, 858 (8 Dec. 1952).

Dyes, pigments, textile chemicals, and equipment are included. C. J. W. H.

Technically Important Extinction Regularities of Dyes. A. Luszczak. *Spetrochim. Acta*, **5**, 41 (1952): *Chem. Abs.*, **47**, 1391 (10 Feb. 1953).

Certain dyes are bleached by radiation in the visible spectrum of wavelength about double that of the main absorption band of the dye itself. No correlation has been found between extinction coefficients and fastness of dyes. C. O. C.

Synthesis of Cresol. S. W. Englund, R. S. Aries, and D. F. Othmer. *Ind. Eng. Chem.*, **45**, 189–197 (Jan. 1953).

Yields of toluenesulphonic acids $> 90\%$, containing 80–85% of the *para* isomer, are obtained with negligible sulphone formation, if excess toluene is sulphonated with 96% H_2SO_4 and the water of reaction is removed, the temperature being kept <150°c. The sulphonic acids are neutralised to the sodium salts and converted to cresols by fusion with NaOH (which is as efficient as KOH) in 65% yield. There is no noticeable rearrangement of the isomers during the fusion. W. K. R.

Synthesis of Polymethylnaphthalenes. B. J. Abadir, J. W. Cook, and D. T. Gibson. *J.C.S.*, 8–17 (Jan. 1953).

Bromination of 2-Methylnaphthalene. N. B. Chapman and J. F. A. Williams. *J.C.S.*, 5044–5046 (Dec. 1952).

Pure *N*-bromosuccinimide reacts with 2-methylnaphthalene in carbon tetrachloride to give 2-naphthylmethyl bromide in 95% yield. If volatile impurities are not removed, and the *N*-bromosuccinimide not used immediately after purification, then 1-bromo-2-methylnaphthalene is the main product. Irradiation with a 500-w. bulb of a 1·5 M. soln. of 2-methylnaphthalene in boiling CCl_4 and dropwise addition of bromine (0·5 mol.) also gives 2-naphthylmethyl bromide in 75–80% yield. H. H. H.

Reaction of Sulphonation. XXV—Certain Properties of Naphthalenetrisulphonyl Chlorides. A. A. Spryskov. *J. Gen. Chem. U.S.S.R.*, **22**, 2035–2038 (Nov. 1952).

The absence of practical methods of separation prevents wider utilisation of all three trisulphonation products of naphthalene. With a view to the devising of such methods, solubilities are determined of the 1:3:5-, 1:3:6-, and 1:3:7-tri-, and the 1:3:5:7-tetra-sulphonyl chlorides in benzene at 20° and 30°c. Also, fusion phase diagrams are determined for the three binary mixtures of trisulphonyl chlorides. A. E. S.

Simultaneous Sulphonation and Nitration in an Aromatic Nucleus. A. Bryson and J. L. Garnett. *Nature*, **171**, 41 (3 Jan. 1953).

When β-naphthylamine is treated with HNO_3–H_2SO_4 at −25°c., a mixture is formed which contains 70% of 1-nitro-2-aminonaphthalene-6-sulphonic acid; the remainder is an isomer of undetermined constitution. The reaction is remarkable in that—(1) there is simultaneous nitration and sulphonation of the aromatic nucleus, (2) the main product results from *ortho–para* direction, (3) a profound difference in reaction mechanism results from small changes in experimental method, and (4) this behaviour is not shown by α-naphthylamine J. W. D.

Reaction of Aniline with Ethylene Oxide. K. D. Petrov and G. B. Talkovsky. *J. Appl. Chem. U.S.S.R.*, **25**, 1225–1227 (Nov. 1952).

A convenient preparation (96·6% yield) of *N*-β-hydroxyethylaniline from aniline and ethylene oxide is described. The diacetic and dibutyric esters of *NN*-bis-β-hydroxyethylaniline are prepared and characterised. A. E. S.

Molecular Association of Oxygen and Aromatic Substances. D. F. Evans. *J.C.S.*, 345–347 (Jan. 1953).

The yellow colour produced by air or oxygen in dimethylaniline, and previously attributed to permanent oxidation, disappears when the oxygen is removed by a stream of nitrogen or by evacuation. Further, various aromatic substances, e.g. anisole, develop a new absorption band (usually in the ultraviolet region) when saturated with oxygen at atmospheric pressure, and this band disappears when the oxygen is removed. The above phenomena are now ascribed to the formation of molecular complexes by the oxygen, similar to those formed by aromatic substances with the halogens and sulphur dioxide. H. H. H.

Emission of Molecular Complexes of Nitro Compounds. R. Foster and D. L. Hammick. *Nature*, **171**, 40 (3 Jan. 1953).

Phosphorescence is induced by ultraviolet radiation in soln. of certain organic substances (particularly nitro compounds) which have been dissolved in a suitable solvent mixture and cooled to the temp. of liquid air. Fluorescence is similarly produced in many cases at ordinary temp. by addition of e.g. NaCN or $NaNO_2$ to the soln. A number of such systems, some of which show fluorescence at ordinary temp., are listed together with the observed colours of fluorescence or phosphorescence. It is suggested that there is immediate complex formation, involving a donor–acceptor mechanism whereby a transition between molecular levels, originally forbidden, becomes permitted in the complex. J. W. D.

Benzotriazole Analogues of certain Naphthalene Dye Intermediates. M. Scalera and F. H. Adams. *J. Amer. Chem. Soc.*, **75**, 715–718 (5 Feb. 1953).

The 5-hydroxybenzotriazole-4- and -6-carboxylic acids have been prepared. Their properties are very similar to

those of the corresponding 2-hydroxynaphthalene-1- and -3-carboxylic acids; e.g. when 5-hydroxybenzotriazole-4-carboxylic acid and 2-hydroxy-1-naphthoic acid are coupled with diazotised aromatic amines, formation of dye is in both cases accompanied by evolution of CO_2, the coupling occurring in the position previously occupied by the carboxyl group. C. O. C.

Mechanism of Diazotisation. E. Abel. *Sitzungsber. Öster. Akad. Wiss. IIb*, **161**, (8–9), 1103–1110 (1952).

Experimental studies of inorg., aliphatic, and aromatic diazotisation processes have shown that under extreme conditions three different kinetics may apply. The velocity of diazotisation may be proportional to—(i) [Amine or ammonia] $[HNO_2]^2$, (ii) $[HNO_2]^2$, or (iii) $[Ar{\cdot}NH_3^+$ or $NH_4^+][HNO_2]$. To explain these results the following general mechanism is developed theoretically—

$$2HNO_2 \rightleftharpoons NO + NO_2 + H_2O$$
$$R{\cdot}NH_3^+ + NO_2 \rightleftharpoons RN{\cdot}NO + H^+ + H_2O$$
$$RN{\cdot}NO + NO \rightarrow RN{\cdot}NO^- + NO^+$$
$$RN{\cdot}NO^- + H^+ \rightarrow RN{\cdot}NOH$$
$$RN{\cdot}NOH \rightarrow RN{\cdot}N^+ + OH^-$$
$$NO^+ + OH^- \rightleftharpoons HNO_2$$

$$R{\cdot}NH_3^+ + HNO_2 = RN{\cdot}N^+ + 2H_2O$$

H. E. N.

Nature of the Internal Hydrogen Bond. I—Tautomerism of 1-Arylazo-2-naphthols. A. Burawoy, A. C. Salem, and A. R. Thompson. *J.C.S.*, 4793–4798 (Dec. 1952).

From the spectra of 1-phenylazo-2-naphthol and its derivatives in various solvents, it is shown that the solutions contain equilibrium mixtures of the phenylhydrazone and azo tautomers. The effects of substituents and solvents on these equilibria are discussed. Formulation of substances containing an internal hydrogen bond as resonance hybrids or by means of any other structure based on the valency conception of non-localised bonds is excluded, these bonds being of an essentially electrostatic nature. For the first time the existence of two molecules of almost identical energy and atomic arrangement is unambiguously discussed. H. H. H.

New Azo Dyes from Naphthidine. K. H. Yuin and C. L. Chein. *Chinese Chem. Ind. Eng.*, **2**, (2), 14–17 (1951): *Chem. Abs.*, **47**, 1393 (10 Feb. 1953).

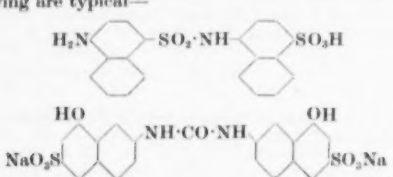
Two dyes were produced by tetrazotising naphthidine and coupling with (1) 1 mol. of salicylic acid and then 1 mol. of H acid, (2) 2 mol. of H acid. Both are direct dyes for cotton, wool, and silk. The first dyes cotton brownish grey (4% dyeing) and wool and silk maroon (3%). The second dyes cotton bright blue (3%), wool violet blue (2%), and silk violet blue (1%). Fastness to light of both dyes on wool and silk is very good; on cotton it is similar to that of common direct dyes. C. O. C.

Azo Dyes derived from 4-Hydroxyquinaldine. J. Décombe and G. Bouchet. *Compt. rend. Acad. Sci. Paris*, **235**, 68–70 (1952): *Chem. Abs.*, **47**, 1932 (25 Feb. 1953).

Coupling of 4-hydroxyquinaldine with diazo soln. occurs only when buffered with sodium acetate. The dyes obtained dye wool in a slightly acid bath. There is no reaction with the diazo derivatives of 1- and 2-naphthylamine or their sulphonic acids. C. O. C.

Synthesis and Investigation of Compounds for the "Azoic" Dyeing of Wool. B. M. Bogoslovsky, Z. S. Kazakova, and P. G. Levinsky. *J. Appl. Chem. U.S.S.R.*, **25**, 1187–1195 (Nov. 1952).

The syntheses are described of 18 substances that can be dyed on wool and then coupled with diazonium salts to give mainly oranges to reds. These substances include products of the sulphonation of various Azotols (azoic coupling components) and other compounds, of which the following are typical—



A. E. S.

Molecular Conductivity of Dyes in Solution and the Influence of Foreign Substance thereon. K. D. Chaudhuri and D. R. Das Gupta. *Indian J. Phys.*, **26**, 67–78 (1952): *Chem. Abs.*, **47**, 1470 (25 Feb. 1953).

Aqueous (0·0005–0·02 M.) soln. of eosin, erythrosin, methyl violet, and cyanine and alcoholic soln. of erythrosin and cyanine showed no linear relation between molecular conductivity and the square root of the concentration, probably because of ionic micelle formation. C. O. C.

Malonamide Colour Formers. R. Thiers and A. E. van Dormael. *Science et Ind. photographiques*, **23**, 386–388 (1952): *Chem. Abs.*, **47**, 1515 (25 Feb. 1953).

The yellow which appears on colour development of a photographic emulsion in a diethyl-*p*-phenylenediamine developer containing malonanilide or an analogous compound is seemingly caused by an impurity, probably the malonamic ester. Malonamides derived from 2-aminothiazoles are good colour couplers for yellow. C. O. C.

Bromination of Acridone. R. M. Acheson and M. J. T. Robinson. *J.C.S.*, 232–238 (Jan. 1953).

Reinvestigation of the bromination of acridone has shown that the product is not the hitherto supposed 2:3-dibromo- but the 3:7-dibromo- or 1:3:7:9-tetrabromoacridone according to the conditions. Vigorous bromination of the latter gives an unidentified hexabromoacridone. H. H. H.

Hydrogen Bonding and Structural Problems in the Amino-acridines and -quinolines. Infrared Studies. L. N. Short. *J.C.S.*, 4584–4589 (Dec. 1952).

The N–H bond stretching frequencies of the five isomeric monoaminoacridines, 2-, 3-, 4-, 6-, 7-, and 8-aminoquinoline, the monoaminoanthracenes, the naphthylamines, and aniline, in dilute solution, indicate the existence of intramolecular hydrogen bonding in 1-aminoacridine and 8-aminoquinoline. All the compounds exist in the amino form under the conditions of investigation. H. H. H.

Oxazole Cyanine and *mero*Cyanine Dyes, and Intermediates. R. A. Jeffreys. *J.C.S.*, 4823–4832 (Dec. 1952).

4-Substituted and 4:5-disubstituted 2-methyloxazoles are synthesised directly from phenacyl bromides and ammonium acetate, while syntheses due to Japp and Murray and to Davidson *et al.* are extended to 4:5-dialkyl- and 4-aryl-oxazoles respectively. These oxazoles, together with 2-methyloxazole, are quaternised and converted into cyanine and *mero*cyanine dyes, which are useful as intermediates for more complex trinuclear dyes. H. H. H.

***mero*Cyanines derived from Thio-oxindole. II—*mero*Cyanines having a Tetramethin, Hexamethin, or Diazadimethin Chain attached to the 3-Thionaphthen Nucleus.** R. H. Glauert and F. G. Mann. *J.C.S.*, 5012–5016 (Dec. 1952).

The preparation of *mero*cyanines of the above types is described; those with tetra- and hexa-methin chains act as photographic sensitisers, but those with diazadimethin chains do not. H. H. H.

Colour of Organic Compounds. VI—Comparison of Isomeric Dyes from 3-Alkyl-2-thiothiazolid-4- and -5-ones. R. A. Jeffreys and E. B. Knott. *J.C.S.*, 4632–4637 (Dec. 1952).

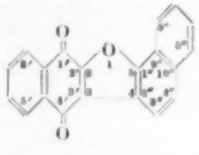
The absorption peaks in methanol of *mero*cyanines derived from 3-alkyl-2-thiothiazolid-5-ones lie at longer wavelengths than those of the isomeric dyes from 3-alkyl-2-thiothiazolid-4-ones. This difference is shown to be largely a function of the lower degree of energetic asymmetry of the former dyes, whose nuclei have also the higher intrinsic colour values. H. H. H.

Colour of Organic Compounds. VII—Complex Cyanines and *mero*Cyanines. E. B. Knott and R. A. Jeffreys. *J.C.S.*, 4762–4775 (Dec. 1952).

Complex cyanines and *mero*cyanines containing 4:5-disubstituted thiazole and oxazole nuclei and, as central nucleus, 3-ethylthiazolid-4-one are prepared, and their properties compared with related dyes derived from benzoxazoles, benzothiazoles, etc. In all cases introduction of a third nucleus brings with it a profound bathochromic shift in absorption. These trinuclear dyes, particularly when carrying a substituent in the dimethin chain, have been set forth (*BIOS* 1355) as red sensitisers for colour-photographic material. H. H. H.

Condensation of 2:3-Dichloro-1:4-Naphthaquinone with α-Naphthols. Ng. Ph. Buu-Hoï and P. Demerseman. *J.C.S.*, 4699–4700 (Dec. 1952).

α-Naphthol and 2:3-dichloro-1:4-naphthaquinone react to give dinaphtho(2′:3′-2:3)(1″:2″-5:4)furan-1′:4′-quinone (I), and the reaction is extended to 4-benzyl-,4-*p*-methylbenzyl-, and 4-*tert*.-butyl-1-naphthol.



(I)

H. H. H.

Anthraquinonoid Acid Dyes. F. Buxtorf and A. Peter. *Textil-Rund.*, **8**, 2–4 (Jan. 1953).

Review of Swiss contributions. Formulæ are given for Alizarin Light Blue 4GL, Light Brown BL, Milling Blue SL, and Brilliant Alizarin Milling Blue BL. Solar Green 3LB is an anthraquinonoid direct cotton dye. H. E. N.

Anthraquinone Mordant Dyes. III— Alizarin Orange. Y. Hosoda. *J. Soc. Org. Synthetic Chem.* (Japan), **9**, 97–102 (1951); **IV— Alizarin Maroon.** *Ibid.*, 132–135; **V— Alizarin Blue R.** *Ibid.*, 159–162; **VI— Alizarin Blue S.** *Ibid.*, 163–167; **VII— Alizarin Red S.** *Ibid.*, 187–188; **VIII— Purpurin.** *Ibid.*, 188–190; *Chem. Abs.*, **47**, 1391–1393 (10 Feb. 1953).

III— Alizarin was nitrated to 3-nitroalizarin (Alizarin Orange) in various ways under conditions found most suitable in industry— (1) in 12 times its vol. of H_2SO_4 with 1·1 mol. of HNO_3 (40°Bé.) in presence of 1 mol. of $B(OH)_3$ followed by hydrolysis with water (purified as its insol. monosodium salt, readily separated from the sol. Na salts of trihydroxynitroanthraquinone, purpurin, and nitropurpurin present as impurities); (2) in 90% acetic acid (recovered and re-used successively four times) with 110% (of calc. value) of HNO_3 at 10–25°c. for 3 hr.; (3) in nitrobenzene (by suspending powdered alizarin passed through 900 mesh) with 114% of HNO_3 at 10–20°c. for 5 hr.; (4) in benzene suspension with 114% of HNO_3 at 40–50°c. for 4 hr.; (5) in *o*-dichlorobenzene instead of benzene.

IV— 3-Nitroalizarin or its Na salt was reduced to 3-aminoalizarin (Alizarin Maroon) by heating at 104°c. for 4 hr. or at 120°c. for 1 hr. in an autoclave with 1·2 mol. of aq. Na_2S_2 while passing in SO_2 or carefully dropping in 0·9 mol. of dil. H_2SO_4 (to prevent pptn. of S).

V— A mixture of 3-nitro- and 3-amino-alizarin (1 : 1·8 mol.) was converted into alizarin-β-quinoline (Alizarin Blue R) by Skraup's reaction with 1·22 mol. of glycerol at 110–120°c. in 2·5 hr. (added slowly to prevent its autocondensation), and the dye purified as its Na salt.

VI— Alizarin-β-quinoline (I) was changed almost completely to its sol. bisulphite cpd. (Alizarin Blue S) with 34·4% $NaHSO_3$ (4 mol.) saturated with SO_2 in 10% of 98% H_2SO_4 at 10–20°c. for 6 days. The free $NaHSO_3$ in H_2SO_4 apparently generated H_2SO_3 (or SO_2), which accelerated the reaction. The pure product contained 9 mol. of water of crystallisation (removed at 60–80°c.; the anhydride was stable below 200°c.) and was readily separated by decantation from the flocculent ppt. of impure dye. On long storage it released SO_2 and reverted to I.

VII— Alizarin was sulphonated to Na 3-alizarinsulphonate (Alizarin Red S) with 15% fuming sulphuric acid (1·1 mol.) at 110°c. for 3–5 hr., and the product salted out. The product contained one molecule of water of crystallisation (removed in a desiccator over H_2SO_4; anhydride stable below 100°c.). Na 5-alizarinsulphonate, obtained similarly with an Hg catalyst, was as good a mordant dye, but K 3:6- and 3:7-alizarindisulphonates and Na sulphonate of mixed flavo- and anthra-purpurins (Alizarin Yellow), obtained similarly, were inferior.

VIII— Alizarin was oxidised to purpurin by Möhlau–Bucherer's method (1) with MnO_2 at 25–30°c. in 10 hr. (at 150°c. as prescribed the yield was low; here a by-product, 1:2:8-trihydroxyanthraquinone, was obtained), (2) with H_3AsO_4 at 140–150°c. in 10 hr. (by-product 1:2:5-trihydroxyanthraquinone, and (3) with HNO_3 at −5°c. in 1 hr. (yield very low). The crude purpurin was best refined by recrystallising from ethyl alcohol (no refining necessary to prepare Alizarin Blue Black).

C. O. C.

4:11:12-Tribromofluoranthene. N. Campbell, W. K. Leadill, and J. F. K. Wilshire. *J.C.S.*, 4615–4618 (Dec. 1952).

The product obtained by direct bromination of fluoranthene is shown to be 4:11:12-tribromofluoranthene (I); this is confirmed by its oxidation to 4:5-dibromophthalic acid.

(I)

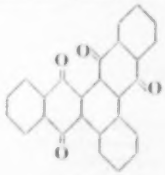
H. H. H.

Polycyclic Aromatic Compounds. VII and VIII— Hydrocarbon of the Pyrene Series from Picene and Benzene. A. Zinke, R. Ott, and O. Schuster. *Sitzungsber. Öster. Akad. Wiss. IIb*, **161**, (6–7), 1100–1102; (10), 1497–1501 (1952).

VII— Perylene and benzene when heated with aluminium chloride yield periflanthene (von Braun and Manz, *Ber. disch. chem. Ges.*, **70**, 1603 (1937)). Picene similarly gives a heptacyclic, pale yellow hydrocarbon, m.p. 331–332°c. On oxidation a red-violet quinone, m.p. 322–323°c., is formed. The orange vat has affinity for cotton.

VIII— To the latter hydrocarbon described above is assigned the formula (I). It is probably identical with the tribenzopyrene obtained by Clar (*J.C.S.*, 2168 (1949)). On oxidation it yields, besides the red-violet quinone, a yellow diquinone (II), m.p. 287°c., prepared in a different manner by Radulescu and Barbulescu (*Chem. Zentr.*, **I**, 623 (1943)). II is converted into an azine by means of hydrazine, into a tetra-acetyl cpd. by reductive acetylation, and into the corresponding hydrocarbon by zinc dust distillation.

(I)

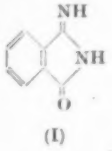


(II)

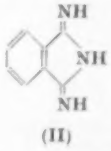
H. E. N.

Heterocyclic Imines. I— Imino Derivatives of *iso*Indoline and their Reaction with Primary Bases. J. A. Elvidge and R. P. Linstead. *J.C.S.*, 5000–5007 (Dec. 1952).

The striking superiority of the imino over the carbonyl group in reactivity has led to the present investigation of 3-imino-1-keto*iso*indoline (I) and 1:3-di-imino-*iso*indoline (II). Such compounds are of interest in the preparation of azomethin dyes (e.g. *BP* 615,697— see *J.S.D.C.*, **65**, 304 (June 1949)) and of macrocyclic pigments.



(I)



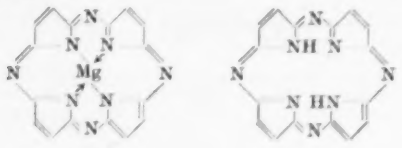
(II)

H. H. H.

Conjugated Macrocycles. XXII— Tetra-azaporphin and its Metallic Derivatives. R. P. Linstead and M. Whalley. *J.C.S.*, 4839–4846 (Dec. 1952).

In continuation of a series of papers on Phthalocyanines and Related Substances (Part XXI— 1950), it has been found that reaction of maleinitrile with magnesium *n*-propoxide in *n*-propyl alcohol (and with similar reagents) leads to magnesium tetra-azaporphin (I) (15% yield), and removal of Mg, by keeping (I) with glacial acetic acid for 1½ hr., gives tetra-azaporphin (II). Copper and nickel derivatives are also described as well as methods for the

preparation of maleinitrile ("maleic dinitrile"). The structure of tetra-azaporphin and its general relationships are discussed.

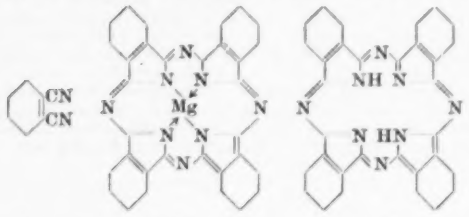


(I) (II)

H. H. H.

Conjugated Macrocycles. XXIII—Tetracyclohexeno-tetra-azaporphin. G. E. Ficken and R. P. Linstead. *J.C.S.*, 4846–4854 (Dec. 1952).

3:4:5:6-Tetrahydrophthalonitrile (I) reacts with various magnesium-containing reagents (e.g. magnesium amyloxide and solutions obtained by decomposing CH_3·MgI with alcohols (ROH), which are equivalent to RO·MgI) to give magnesium tetracyclohexenotetra-azaporphin (II), from which boiling glacial acetic acid gives tetracyclohexenotetra-azaporphin (hexadecahydrophthalocyanine) (III). Copper and nickel derivatives of III are prepared by metal-exchange and by reaction of the metal-free compound with suitable reagents. III is dehydrogenated to phthalocyanine thermally at 300–320°C. or by treatment with sulphur. The colour, fluorescence, light absorption, and chemiluminescence of these substances are described.

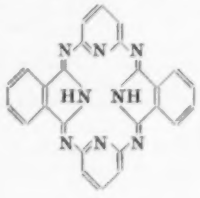


(I) (II) (III)

H. H. H.

Conjugated Macrocycles. XXIV—New Type of Cross-conjugated Macrocycle, related to the Azaporphins. J. A. Elvidge and R. P. Linstead. *J.C.S.*, 5008–5012 (Dec. 1952).

1:3-Di-imino*iso*indoline (p. 167) readily reacts with 2:6-diaminopyridine to give a red compound (I), which contains a cross-conjugated macrocyclic system of a novel type, related to the azaporphins, and which forms metallic derivatives of high thermal stability with the metal in the centre of the ring. Light-absorption data are discussed.



(I)

H. H. H.

Fluorescent Brightening Agents. E. C. Caspar. *Textil-Rund.*, **8**, 22–27 (Jan. 1953).

A description of the principles and the development of optical bleaching agents. H. E. N.

Chelate Systems—I. T. H. Simpson and L. Garden. *J.C.S.*, 4638–4644 (Dec. 1952).

It is shown by paper partition chromatography that the pyrone carbonyl group of flavones forms stronger hydrogen bonds with the 5- than with the 3-hydroxyl group, and the ability to form bonds with both hydroxyl groups simultaneously has been observed. The new 4′-hydroxy-7-, 4′-hydroxy-5-, 7-hydroxy-3:5-di-, 3:4′-dihydroxy-7-, and 3:7-dihydroxy-4′-methoxyflavones are synthesised.

H. H. H.

Chelate Systems—II. B. L. Shaw and T. H. Simpson. *J.C.S.*, 5029–5032 (Dec. 1952).

From the R_M values of a number of 4′- and 3′-hydroxyflavones, it follows that a 4′-hydroxyl group stabilises the carbonyl–3-hydroxyl more than the carbonyl–5-hydroxyl chelate system. This result supports the electronic mechanisms suggested in Part I (above). H. H. H.

An Anthocyanidin of Louro Inamui (*Nectandra eleophora*). E. Cocker and W. Cocker. *J.C.S.*, 5035–5036 (Dec. 1952).

Compounds of Curcumin and Boric Acid. I—Structure of Rosocyanin. G. S. Spicer and J. D. H. Strickland. *J.C.S.*, 4644–4650 (Dec. 1952).

Rosocyanin, the compound formed when curcumin (turmeric extract) reacts with boric acid in the presence of a mineral acid, is shown to contain two curcumin molecules co-ordinated around a boron atom, associated with one equivalent of an anion. H. H. H.

Compounds of Curcumin and Boric Acid. II—Structure of Rubrocurcumin. G. S. Spicer and J. D. H. Strickland. *J.C.S.*, 4650–4653 (Dec. 1952).

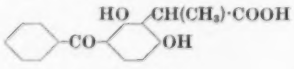
The red substance formed when curcumin reacts with boric acid in the presence of oxalic acid is found to be a 1 : 1 : 1 compound of curcumin, boron, and oxalate, and has been named *rubrocurcumin*. A structure is deduced similar to that of rosocyanin, but containing the curcumin molecules joined by a boro-oxalate bridge. The use of rubrocurcumin and rosocyanin in the determination of boron is briefly discussed. H. H. H.

Compounds of Curcumin and Boric Acid. III—Infrared Studies of Rosocyanin and Allied Compounds. L. J. Bellamy, G. S. Spicer, and J. D. H. Strickland. *J.C.S.*, 4653–4656 (Dec. 1952).

The infrared spectra of curcumin and rosocyanin are compared with those of their related acetylacetone complexes, and with the corresponding beryllium compounds. The data support the structures deduced in Parts I and II (preceding abstracts). H. H. H.

Pigments of "Dragon's Blood" Resin. IV—Oxidation of some Anhydro-7-hydroxybenzopyranols. P. Broadbent, A. Robertson, and W. B. Whalley. *J.C.S.*, 4957–4959 (Dec. 1952).

In view of the importance of draconol as a primary degradation product of dracorubin, model oxidations of the anhydro-bases from 7-hydroxy-2:4-diphenylbenzopyranols with methanolic alkaline hydrogen peroxide are described, but all give benzoic acid as the only recognisable product, showing the non-survival of that part of the molecule having a structure of type (I).



(I)

H. H. H.

Synthesis of Homologues of Echinochrome—III. O. Brunner, E. Müllner, and G. Weinwurm. *Sitzungsber. Öster. Akad. Wiss. IIb*, **161**, (10), 1477–1484 (1952).

An improved method of synthesis of these cpd. is illustrated by the preparation of 3-ethyl-2-hydroxy-5-(and 7)-methoxy-1:4-naphthaquinones. H. E. N.

Melanin and its Precursors. VI—Further Syntheses of 5:6-Dihydroxyindole and its Derivatives. J. Harley-Mason. *J.C.S.*, 200–203 (Jan. 1953).

5:6-Dihydroxyindole is obtained in good yield by autoxidation of 2-(6-amino-3:4-dihydroxyphenyl)ethylamine and by ferricyanide oxidation of 2-(2:4:5-trihydroxyphenyl)ethylamine. 5:6-Dihydroxy-2-methyl- and -2:3-dimethylindole are readily obtained by demethylation of the corresponding 5:6-dimethoxyindoles with hydrobromic acid. H. H. H.

Effects of some Chelate Compounds upon the Formation *in vitro* of Melanin. S. Isaka and S. Ishida. *Nature*, **171**, 303–304 (14 Feb. 1953).

Manometric measurements indicate that the oxidation of dihydroxyphenylalanine is much more highly accelerated by the presence of both folic acid and cupric sulphate than by the latter alone; folic acid itself has no effect. The rate of solution blackening is higher than that due to oxygen uptake. Xanthopterin behaves similarly, being more

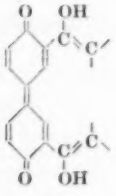
active than folic acid in presence of Cu^{++}, and leucopterin does not accelerate the oxidation even with Cu^{++}. It is suggested that pterin–metal chelate compounds behave similarly to enzymes in accelerating dihydroxyphenylalanine autoxidation, their activities differing according to their ring structures. The accelerating effect of riboflavin, however, is hindered by prior admixture with Cu^{++}; independent addition of Cu^{++} accelerates the oxidation. Similarly, xanthopterin will hinder the decolorisation of a dopa-chrome–zinc sulphate system, owing to chelation of Zn^{++} with xanthopterin. J. W. B.

Pteridine Studies. IV—4:6- and 4:7-Dihydroxypteridine. A. Albert and D. J. Brown. *J.C.S.*, 74–79 (Jan. 1953).

Colouring Matters of the Aphididæ. VI—Glucosidic Nature of Protoaphin. B. R. Brown, T. Ekstrand, A. W. Johnson, S. F. MacDonald, and A. R. Todd. *J.C.S.*, 4925–4928 (Dec. 1952).

Colouring Matters of the Aphididæ. VII—Addition Reactions of Erythroaphin-*fb*. B. R. Brown, A. W. Johnson, S. F. MacDonald, J. R. Quayle, and A. R. Todd. *J.C.S.*, 4928–4935 (Dec. 1952).

Chemical evidence is given which supports the conclusion that the erythroaphins from various aphid species are extended quinones (i.e. compounds in which the quinone carbonyl groups are in different rings) containing two hydroxy groups so situated that they can form chelated 6-membered rings with the carbonyl groups: i.e. they contain the grouping (I).



(I)

H. H. H.

PATENTS

Aryl Sulphonic Esters of Anthranilic Acid. Ciba. *BP* 687,789

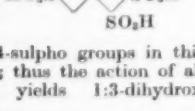
On treatment with ammonia, compounds (I) (Ar = benzene-series radical which may contain COOH and/or a substituent incapable of salt formation) yield azo dye intermediates, the Cl being replaced by NH_2. Thus *o*-chlorobenzoic acid is treated with chlorosulphonic acid to produce 3-carboxy-4-chlorobenzenesulphonyl chloride, which is converted to the sulphonic ester with salicylic acid. On heating with ammonia and Cu powder in an autoclave at 125–130°c. the anthranilic acid derivative (II) is produced.

(I) (II)

E. S.

1-Naphthol-2:3:4:6-tetrasulphonic Acid. Gy. *BP* 687,801

On sulphonating 1-naphthol-3:6-disulphonic acid with e.g. 40% oleum at 120–125°c., 1-naphthol-2:3:4:6-tetrasulphonic acid is produced as a sultone of probable formula—



The 2-, 3-, and 4-sulpho groups in this compound are easily replaceable; thus the action of alkali followed by acid hydrolysis yields 1:3-dihydroxynaphthalene-6-sulphonic acid. E. S.

Azo Coupling Components for Diazotype Paper. E. N. Mason & Sons. *BP* 688,159

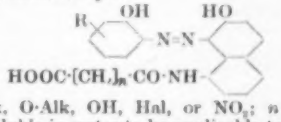
The product obtained on heating 2:7-dihydroxynaphthalene with 2–3 times its weight of conc. H_2SO_4 for 1 hr. in a steam bath is mainly 2:7-dihydroxynaphthalene-3:6-disulphonic acid, possibly with a little 2:7-dihydroxynaphthalene-3-sulphonic acid. Used in diazotype coatings it results in excellent stability to precoupling, develops quickly in presence of alkali to full deep blues, and gives a clean white ground, both ground and line being fast to light. C. O. C.

Oil-soluble Azo Dyes. Basf. *BP* 688,000

Naphthols containing at least one Alk of > 2 C are coupled with aromatic diazo compounds which may contain azo groups but which are free from OH or other hydrophilic group, or with tetrazo compounds of the same character, to produce dyes soluble in oils and lacquers. They are useful for colouring linseed oil sizes, as they do not dye the sized fibres and are completely removed from the fibres with the sizing agent. Thus β-naphthol is condensed with a mixture of *iso*hexylene and *iso*heptylene in presence of BF_3, and the product coupled with diazotised *o*-anisidine to give a red monoazo dye. E. S.

Metal-complex Monoazo Dyes for Nylon. General Aniline. *USP* 2,602,080

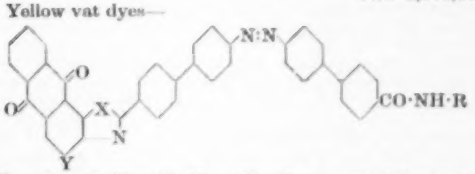
The V, Cr, Mn, Fe, Co, Ni, Cu, and Zn complexes of *oo'*-dihydroxymonoazo dyes—



(R = H, Alk, O·Alk, OH, Hal, or NO_2; n = 2–8) are sufficiently soluble in water to be applicable to nylon from a neutral or slightly acid bath. Thus the Co complex of 4-chloro-2-aminophenol → 1-β-carboxypropionamido-7-naphthol dyes nylon dark grey from an acetic acid dyebath. E. S.

Yellow Vat Dyes of the Anthraquinone–Oxazole and –Thiazole Series containing an Azo Group. DuP. *USP* 2,601,100

Yellow vat dyes—

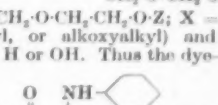


(X = O or S; Y = H, Cl, or Br; R = a vattable anthraquinonyl radical attached at either its α or β position to the N and carrying COOH in the ring remote from the CO·NH group) differ from the related dyes of *USP* 2,559,669 (J.S.D.C., **68**, 273 (July 1952)) and 2,587,908 (J.S.D.C., **69**, 35 (Jan. 1953)) in being suitable for printing as well as dyeing. Thus sodium 4:4′-azodiphenyl-4″:4‴-dicarboxylate is suspended in nitrobenzene and converted to the acid chloride by means of thionyl chloride. Condensation is then effected first with 1 mol. of 2-amino-1-chloroanthraquinone and then with 1 mol. of the mixture of 1-aminoanthraquinone-6(and 7)-carboxylic acids obtained by the nitration and reduction of anthraquinone-2-carboxylic acid. Ring-closure to the oxazole is effected by heating with copper salts and potassium acetate. E. S.

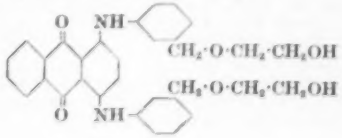
Aminoanthraquinones—Dyes for Acetate Rayon fast to Burnt Gas Fumes. General Aniline. *BP* 687,807

See *USP* 2,585,681 (J.S.D.C., **69**, 34 (Jan. 1953)).

Blue dyes for acetate rayon that are fast to burnt gas fumes have at least one α-position occupied by—



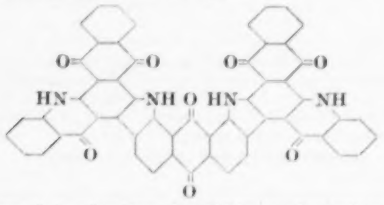
(R = H or CH_2·O·CH_2·CH_2·O·Z; X = H or CH_3; Z = H, hydroxyalkyl, or alkoxyalkyl) and the remaining α-positions by H or OH. Thus the dye—



is prepared by heating leucoquinizarin with β-*m*-aminobenzyloxyethanol and boric acid in β-methoxyethanol at 90–95°C. for 16 hr. R. K. F.

Anthraquinone–Benzacridone–Carbazoles — Vat Dyes. Ciba. *BP* 686,422

Red to brown light-fast vat dyes are made by condensing a 1:8-dihalogenoanthraquinone with either 2 mol. proportions of a 4-aminoanthraquinone-2:1(N)-1′:2′(N)-benzacridone or 1 mol. proportion thereof followed by 1 mol. proportion of a 1-aminoanthraquinone, and finally cyclising to the dicarbazole. Thus the dye—



is prepared by heating 1:8-dichloroanthraquinone and 4-aminoanthraquinone-2:1(N)-1′:2′(N)-benzacridone together with sodium acetate in boiling naphthalene. The resulting trianthrimide is cyclised by heating at 80–100°C. in a melt of $AlCl_3$ and NaCl through which SO_2 is passed. R. K. F.

Sulphuric Esters of *leuco*-Anthraquinone Derivatives. American Cyanamid Co. *BP* 687,456

Sulphuric esters of leucoanthraquinonoid compounds are obtained in one stage as compared with the two stages of *BP* 585,106 by subjecting the anthraquinone derivative in aq. suspension at pH < 11·5 to the simultaneous actions of a reducing agent and an SO_2 addition compound of a tertiary amine in the presence of a small amount of a water-immiscible organic liquid or a water-soluble benzene- or naphthalene-sulphonate. Thus the vat dye Brown BR is suspended in water containing Na xylenesulphonate and Na_2CO_3, at 50°C. While N_2 is passed through the suspension, the SO_2–triethylamine addition compound is added, followed by hydrosulphite. The ester is separated by adding NaOH and distilling off the amine. R. K. F.

Metal-free β-Phthalocyanine. Ciba. *BP* 687,387

Metal-free β-phthalocyanine is ground in presence of a substratum, e.g. anhyd. sodium ferrocyanide, and > 2% of a non-basic organic liquid of b.p. < 200°C., e.g. ethanol or hexane. The pigment after removal of the substratum by washing is the β-modification. R. K. F.

Phthalocyanine Pigments. ICI. *BP* 686,395

Phthalocyanine derivatives, in which at least one of the four pyrrole nuclei forms part of a condensed ring system having a 6 C-alicyclic ring sharing the two C atoms not linked to N are violet pigments. They are prepared by heating a 3:4:5:6-tetrahydrophthalonitrile, or a mixture thereof with a phthalonitrile and/or a maleinitrile, with a metal-containing compound; or by heating together the corresponding carboxylic acids or their anhydrides with urea and a metal-containing compound. Thus 3:4:5:6-tetrahydrophthalic anhydride, urea, anhyd. nickel chloride, and ammonium molybdate are heated in nitrobenzene for 4 hr. at 130°C. R. K. F.

Water-soluble Phthalocyanine Dyes. ICI. *BP* 686,391

Green water-soluble dyes, especially suitable for printing cotton, are made by first condensing a chlorophthalocyanine with an alkali-metal phenoxide or thiophenoxide, substituting in the resulting attached phenyl nuclei by treating with *s*-dichloro(or dibromo)dimethyl ether, and finally converting the halogenomethyl derivative so obtained to the corresponding *iso*thiouronium compound by condensing with a thiourea. Thus copper tetra-4-chlorophthalocyanine is heated with *p*-thiocresol and NaOH in benzyl alcohol, and the resulting *p*-tolylthio compound treated with *s*-dichlorodimethyl ether at 25°C. in presence of $AlCl_3$ and nitrobenzene. Lastly, the product is fused with tetramethylthiourea and a small amount of water at 95–100°C. R. K. F.

Oxonol Dyes. Kodak Ltd. *BP* 688,038

Inclusion of four *cyclo*hexyl groups in a molecule of an oxonol dye imparts an excellent non-diffusing effect, and at the same time makes it readily crystallisable. C. O. C.

Golden-yellow Cadmium Sulphide Pigments. IC. *USP* 2,607,705

Transparent, brilliant golden-yellow pigments are obtained by controlling the particle size of the CdS within the range 0·01–0·05 μ. so that the average particle size is 0·02 μ. This is accomplished by (1) use of dilute solutions of the reactants, (2) carrying out precipitation at low temperatures, i.e. < 90°C., (3) rapid precipitation with vigorous agitation, (4) rapid separation of the precipitate from the liquor, and (5) eliminating calcination. C. O. C.

Carbon Black. Columbian Carbon Co. *BP* 687,867

Modification of *BP* 673,401 (J.S.D.C., **68**, 322 (Aug. 1952)). The carbon black is heated at 2300–2500°F. while suspended in furnace gases in which the free oxygen content is kept at 0·1–2·0% by vol. This results in a black of increased adsorptivity. C. O. C.

Furnace Black. Godfrey L. Cabot. *BP* 688,776

A method of separating solid particles from gaseous media by means of liquid sprays or curtains and converting the resulting slurry into pellets. C. O. C.

Lead Titanate Pigments. Glidden Co. *USP* 2,607,659

Lead titanate $PbTiO_3$ can be prepared directly as a pigment of good quality by calcining a mixture of TiO_2 pigment and a lead compound which liberates lead oxide during calcination. C. O. C.

Non-specific Precipitation of Proteins by Polyhaptenic Dyes (XII p. 178).

V— PAINTS; ENAMELS; INKS

PATENT

Steam-setting Printing Ink. A. F. Schmutzler and D. F. Othmer. *USP* 2,606,123–4

A vehicle for an ink, of high humidity and water tolerance but readily settable on exposure to steam, consists of an anhydrous non-prolamine protein, of high water tolerance and dispersible in ethylenediamine, and a peptising agent dispersed in a C_3–C_8 di- or tri-hydric alcohol, ethylenediamine being the dispersing agent. C. O. C.

VI— FIBRES; YARNS; FABRICS

Science and the Textile Industry. B. Lockspeiser. *J. Textile Inst.*, **43**, P 893–P 902 (Dec. 1952).

From Philosopher's Toy to Industry's Headache — The Story of Static Electricity. S. M. Edelstein. *Amer. Dyestuff Rep.*, **42**, P 70–P 75 (2 Feb. 1953).

Bonded-fibre Fabrics. H. E. Shearer. *Amer. Dyestuff Rep.*, **41**, P 874–P 879 (22 Dec. 1952).

Bonded fibrous-web materials may be varied in composition and structure to give a range of physical characteristics comparable with that obtained in woven fabrics. Equipment for carrying out wet processing by new arrangements of existing textile machinery, and by newly developed machines which convert the raw material to finished fabric by a continuous process, is described and illustrated. Dyeing and finishing are also discussed. J. W. B.

Gliding Behaviour of Fibres. H. L. Röder. *Symposium on "The Physics of Fibrous Materials"* (Arnhem: Dutch Physical Society, 1950), pp. 61–84.

Spinning of cotton fibres involves continuous stretching and gliding of fibres past each other. The resistance set up by sliding of fibres depends mainly on (*a*) the lubricant or finishing agent and (*b*) the geometrical structure of the fibres. An apparatus for the determination of the static (μ_{ps}) and dynamic (μ_{pd}) coefficients of friction of two fibres at right angles is described. For fibres moving at 90 cm./min., finishing agents with no special affinity for cellulose lead to $\mu_{ps} > \mu_{pd}$, anion-active compounds to $\mu_{ps} < \mu_{pd}$, and cation-active compounds to $\mu_{ps} \ll \mu_{pd}$. Scroop is observed when $\mu_{ps} > \mu_{pd}$, and the fibre is suitable for carding only if $\mu_{ps} - \mu_{pd} > 0$. Finishing agents leading to very low values of μ_{ps} cause difficulties in winding. Both coefficients decrease with increasing load on the fibre. Increase of speed increases μ_{pd}, and at high speeds frictional resistance between fibres is caused mainly by direct contact. The effect of quantity of finishing agent is briefly discussed, and some suggestions are made as to the arrangement of the molecules of finishing agent under various conditions of gliding. W. R. M.

Electron Micrographs of Fragmentation Products of Textile Fibres. D. G. Drummond. *J. Textile Inst.*, **44**, T 53–T 58 (Feb. 1953).

Approx. 0·5-g. lots of various fibres, each in 200 ml. of water, are disintegrated in a Waring Blendor to obtain randomly fragmented samples, electron micrographs of which are illustrated. Natural cellulosic fibres— cotton, ramie, and linen— all show fibrils of great length; similar fibrils are shown with regenerated cellulosic fibres, particularly highly oriented types, but with the interesting exception of cuprammonium rayon, which gives a spongy mass. Cellulose acetate shows a third type, as a network of short fibrils. Dry breakdown is studied with cotton only, at normal regain, woven fabric being used and the air-borne detritus being collected to avoid reimpaction and reaggregation. Two definite stages of abrasion are shown — (i) showing no fibrillar structure, presumably from the primary cell wall; and (ii) dense chip-like particles, from the secondary cellulose. Acid treatment of cotton leads to coarse lumps, in some of which an internal fibrillar structure is obscured by structureless material. A tentative explanation is given in terms of known cotton structures.

J. W. B.

Mechanical Properties of Jute—I. M. M. Roy and R. R. Mukherjee. *J. Textile Inst.*, **44**, T 36–T 43; **II.** M. M. Roy. *Ibid.*, T 44–T 52 (Jan. 1953).

I— Tensile tests are made on the root, middle, and top portions of jute strands, and the effects of humidity on the tenacity, Young's modulus, and extension at break examined.

II— Tensile tests are made on raw jute, on progressively delignified jute, and on jute treated with NaOH of different concentrations so as to remove the hemicelluloses but leave the lignin practically unchanged. Load–elongation curves of delignified jute are linear, while those for fibres treated with 1% or 5% alkali resemble that of cotton. Delignification and alkali lower the strength, the greatest effect being obtained with strong NaOH; extension at break does not change much on delignification and on alkali treatments up to 9·0%, but beyond 9·0% the extension increases sharply. Application of tension after treatment with 17·5% NaOH increases the strength and decreases the % extension at break compared with unstretched, the increase being directly related to the degree of stretching. On wetting, all samples are weakened to about the same extent, except for that containing 0·78% residual lignin, which loses strength entirely when wetted. J. W. B.

Sources of the Natural Colour of Animal and Vegetable Fibres [especially Flax]. A. Herzog. *Melliand Textilber.*, **33**, 1073–1076 (Dec. 1952).

A brief discussion, illustrated by photomicrographs, is given of present knowledge concerning the nature and distribution within the fibre of the colouring matters of wool, hair, silk, flax, and cotton. Colouring matters arise in flax during processing, partly owing to the action of bacteria on water-sol. substances, particularly tannins, that are present. Various suggestions are made with respect to the processing of flax, including the recommendation that the stalk, prior to retting, should be thoroughly extracted with cold water in order to remove some of the substances that give rise to colour. A. E. S.

Water Absorption in the Lattice Region of Cellulose II (Cellulose Hydrate). W. Kast and R. Schwarz. *Z. Elektrochem.*, **56**, 228–233 (1952): *Chem. Abs.*, **47**, 939 (10 Feb. 1953).

The 101 spacings in crystals of cellulose II (regenerated cellulose fibres) have been measured and the results compared with the data of previous workers. The most stable of the hydrated celluloses are (i) that which has been dried and then completely moistened and (ii) fully hydrated cellulose containing 68 mol. of water per unit cell.

C. O. C.

Electron-microscopic Study of Frictional Abrasion in the Viscose Rayon Spinning Process. N. Takahashi and T. Asaeda. *Bull. Inst. Text. France*, (35), 75–82 (Oct. 1952).

A technique enabling replicas of polished metallic and glass surfaces to be obtained in the form of Al films is described. The method is also applied to the examination of fibre cross-sections. The pigment particles of delustred rayon appear to function as an abrasive powder embedded in a plastic medium. Friction results in localised overheating effects on the surfaces of spinneret holes and glass guides. The effect is enhanced on the guide hooks by the poor thermal conductivity of glass; consequently wear is considerable and submicroscopic fractures are observed. It is recommended that glass be replaced by heat-resistant Ti porcelain. The distribution and state of agglomeration of the pigment particles on the polished rayon fibres are discussed. G. L.

Interfibre Friction of Viscose Rayon. J. C. Guthrie and P. H. Oliver. *J. Textile Inst.*, **43**, T 579–T 594 (Dec. 1952).

Interfibre friction measurements are made on viscose rayon fabrics using a slip-stick apparatus in which one fibre is attached to a torsion wire and another moves across it at a given angle and fixed speed, thus twisting the wire and actuating a mirror–light beam system. Alternate slipping and sticking produces deflections which are recorded photographically. The following aspects are considered— accuracy of measurement; effects of fibre tension, normal force, denier, angle of contact between fibres, and titanium dioxide delustrant; measurements on spun-dyed Fibro; measurements on heavily dyed fibres; and scroop finish on viscose rayon. J. W. B.

Follicle Development in the Australian Merino. P. G. Schinckel. *Nature*, **171**, 310–311 (14 Feb. 1953).

Progress of development of the follicle population, measured by the secondary : primary (S/P) follicle ratio, is studied on the skins of twin lambs and on singles born from young ewes, at different ages. The consistently lower ratio found, compared with that from groups of lambs randomly selected, suggests some nutritional penalty, and on analysis indicates prenatal environment. The rate of secondary follicle development during early postnatal life is closely associated with the general growth-rate.

J. W. B.

Structure of the Wool Fibre. M. Leveau, J. Derminot, and A. Parisot. *Bull. Inst. Text. France*, (35), 9–24 (Oct. 1952).

A review of recent progress in the study of morphological features and chemical composition of the cuticle, epicuticle, intermediate zone, cortex, and medulla. Problems still awaiting solution are summarised.

G. L.

Recent Work on the Fine Structure and Chemistry of Silk. H. Zahn. *Melliand Textilber.*, **33**, 1076–1084 (Dec. 1952).

A review of recent work on the morphology, X-ray structure, and amino-acid composition of silk and on effects produced by treating silk with nitric acid, with 1:3-difluoro-4:6-dinitrobenzene, and with 1-fluoro-2:4-dinitrobenzene. There are 35 references. A. E. S.

Degradation of Fibroin. S. N. Beketovsky. *J. Appl. Chem. U.S.S.R.*, **25**, 1335–1336 (Dec. 1952).

Progressive damage of fibroin by means of acid is characterised by a gradual fall in viscosity (in $ZnCl_2$ soln.) and a continuous increase in the amino-N content, whereas damage caused by alkali results in a rapid fall in viscosity, but no appreciable change in the amino-N content. It is considered that alkaline hydrolysis occurs preferentially at proline linkages, yielding free NH groups, which are not revealed in the amino-N determination. A. E. S.

Compound Helical Configurations of Polypeptide Chains— Structure of Proteins of the α-Keratin Type. L. Pauling and R. B. Corey. *Nature*, **171**, 59–61 (10 Jan. 1953).

The axis of the α-helix for a polypeptide chain involving repeating sequences of different kinds of amino-acid residues would itself be expected to pursue a helical course. Thus, a protein might consist of a single polypeptide chain with a compound helical configuration; three such helixes might twist around one another to give a three-strand helix; six may be expected to twist about a seventh; and so on. It is believed that hair, horn, quill, and other proteins of the α-keratin type consist of seven-strand protein cables in parallel orientation, with single compound α-helixes occupying the interstices. Such structures are illustrated, and the spatial and X-ray implications examined in detail and shown to correspond closely with the characteristics of known proteins. J. W. B.

Properties of Man-made Fibres. P.-A. Koch. *Textil-Rund.*, **7**, 559–585 (Dec. 1952); (erratum) **8**, 54 (Jan. 1953).

A review with 63 references dealing with the following aspects— economics, history, nomenclature, diversity, appearance, chemical reactivity, and physical properties. Very useful tables are given for— classification, chemical reactivity, chemical identification, thermal behaviour, regain, specific gravity, strength, extensibility, crease-resistance, brittleness, dyeing properties, and uses of these fibres. The generic name *chemofil* is proposed for describing man-made textile material in filament form (both of a regenerated and of a synthetic nature), the term *chemofil fibres* to cover the same substances in staple form.
H. E. N.

Fibrous Materials from the Physical Point of View. J. M. Goppel. *Symposium on "The Physics of Fibrous Materials"* (Arnhem: Dutch Physical Society, 1950), pp. 13–36.

Some conditions limiting the use of linear polymers as textile materials are discussed. The interplay of two factors— internal mobility of chains and intermolecular cohesion— determines whether a given polymer will behave as a fibre in a certain temperature range. Mobility depends on the nature of the atoms in the chain, linkages within the chains, and intramolecular valency forces. Intermolecular cohesion depends on the nature and shape of the chains and on crystallisation. A crystallisable polymer, on cooling, may exhibit two transition points— a temperature of crystallisation T_k and a temperature of induration T_o, at which Brownian motion of chains in the amorphous regions ceases. Values of T_k and T_o are given for a number of polymers. For textile fibres T_k should be well above and T_o well below the temperature of use. Introduction of polar groups into polyamides generally raises T_k. Substitution lowers T_k. Introduction of plasticisers generally lowers T_o, this effect being specially significant when T_o is near the temperature of use.
W. R. M.

Synthetic-polymer Fibres. B. P. Ridge. *J. Textile Inst.*, **44**, P 48–P 65 (Feb. 1953).

A survey of the physical and chemical properties of synthetic-polymer fibres.
J. W. B.

PATENT

Processing Molten Cellulose Derivatives into Threads and other Shaped Articles. FBy. *BP* 688,313

Cellulose derivatives are more easily worked into threads or other shaped articles, from the molten state, if the derivative has a water content between that which it would normally have after being exposed to the open air and the saturation point observed on melting. Improved properties, e.g. uniformity of thread, are obtained by prior disintegration to below 1 mm. mesh.
J. W. B.

Important Developments in 1952 (VIII p. 173).
Alkarylsulphonates as Conditioners in Wet-twisting Cotton Tyre Cord (X p. 175).
Bacterial Damage of Textiles (X p. 176).
Effect of High-energy Radiation on Long-chain Polymers (XIII p. 178).
X-Ray Studies of the Reaction between Polyvinyl Alcohol and Congo Red (XIII p. 178).
Effect of Wiley Mill Cutting on Solubility of Cellulose Fibres (XIV p. 180).

VII— DESIZING; SCOURING; CARBONISING; BLEACHING

Efficiency of Detergents and Washing Methods in Laundering Wool. M. S. Furry and E. M. O'Brien. *Amer. Dyestuff Rep.*, **41**, 861–862 (22 Dec. 1952).

Five detergents are evaluated for their soil-removing and whiteness-retaining efficiency by washing artificially soiled wool test fabrics under various conditions of temperature and agitation. Agitation of samples is in general more effective than temperature in removing soil and in retaining whiteness in unsoiled material. Unbuilt soap and unbuilt and built sodium lauryl sulphate products remove most soil, followed by built non-ionic polyglycol ester and finally unbuilt sulphated glyceryl ester. Whiteness retention in unsoiled fabric follows a similar order.
J. W. B.

Microscopic Study of Molecular Complex Formation and Soil Removal. D. G. Stevenson. *J. Textile Inst.*, **44**, T 12–T 35 (Jan. 1953).

The action of detergents on soiled fibres and on the soiled inner walls of an optical cell is studied with a projection microscope. Complex formation between fatty acids, long-chain alcohols, and detergents appears to be important in removing soil; complex formation is divided into two classes— (*a*) formation in the bulk phase, which results in the separation of a third, complex phase, and which gives rise to gelatinous and often birefringent systems composed of myelinic figures or anisotropic droplets, the action being related to solubilisation; and (*b*) formation at an oil–water interface by interaction between adsorbed oil-soluble and water-soluble molecules, resulting in an extra low interfacial tension. Such interaction appears essential for the removal of oils from oleophilic fibres. Salts inside fibres are of considerable importance, their function being to inflate gelatinous layers of complex by osmosis, thus loosening and dispersing the soiling matter; in dilute solutions complexes may be formed and acid soap adsorbed on to the fibre without extensive soil removal. Non-ionic detergents appear to function by complex formation and solubilisation rather than by "rolling up" and emulsification. Molecular complexes are undesirable in being gelatinous, thus hindering free dispersion of soil, and in adsorbing detergent during formation. There are 34 photomicrographs.
J. W. B.

Reflectance as a Measure of the Soil Content of Cotton Fabric. I. Reich, F. D. Snell, and L. Osipow. *Ind. Eng. Chem.*, **45**, 137–141 (Jan. 1953).

Detergency is usually evaluated by measuring the change in reflectance of artificially soiled patterns, but this property is not a linear function of soil removal. The reflectance of soiled cloth can be correlated with the amount of soil present by the equation—

$$\log\left[\frac{(1-R)^2}{2R}-\frac{(1-R')^2}{2R'}\right]=n\log G+\text{const.}$$

(R and R' = reflectances of the soiled and clean cloth respectively; G = amount of soil present). When $n = 1$, the equation becomes the Kubelka–Munk equation. During washing, the value of n is frequently 1, but during artificial soiling n is often 0·65–0·7. These results indicate that in deposition of soil from a solvent, agglomeration rather than uniform distribution of fresh soil particles may occur, but removal of soil by a detergent solution appears to be mainly due to removal of entire flocs rather than to a reversal of the process by which the flocs were formed.
W. K. R.

Course of Fibre Degradation during Laundering— I [Cotton] and II [Rayon Staple]. H. Vollenbruck. *Melliand Textilber.*, **33**, 856–859 (Sept.), 1105–1107 (Dec. 1952).

Cotton and staple viscose rayon fabrics are submitted to a succession of alkaline hypochlorite treatments, identical for a given series, but varying in severity from one series to another. The degree of polymerisation (D.P.) of the cellulose is determined viscosimetrically after each treatment, and chemical damage produced by each treatment, as measured by Eisenhut's damage factor (see *J. prakt. Chem.*, **157**, 338 (1941): the factor is considered to give, independently of the initial D.P., a measure of the number of chain ruptures produced in the process), is found to fall gradually as the degree of degradation increases. For D.P. values > 500 for cotton and > 100 for viscose rayon, the courses of the D.P.–time curves for bleaching processes of varying severity can be made to coincide by making suitable proportionate changes in the scale of the time axis. A general curve is constructed in this way, and it serves as a reference diagram for the examination of the effect on materials of varying initial D.P. of repeated commercial laundering treatments that include a hypochlorite or peroxide bleach. In absence of catalyst, soiling does not affect the course of degradation, but contamination of the fabric with copper and the use of copper or brass washing machines may lead to an accelerated fall in D.P. Agreement with predictions from the reference curve is much better for viscose rayon than for cotton, and the former material is recommended for use in the control of laundering processes. For D.P. values < 500 for cotton and < 100 for viscose rayon, the

differences in degradation rate for the various treatments cannot be adjusted by a simple change in the time scale; in this range, the less severe treatments are found to be abnormally mild in their degradation effects when the adjustments necessary to bring the points for higher D.P. on to a common curve have been made A. E. S.

Bleached Linen and the Fluidity Test. C. Garrett. *J. Textile Inst.*, **43**, P 903–P 904 (Dec. 1952).

It is suggested that the cuprammonium fluidity test be used as a control for linen bleaching. Insoluble matter which might clog the capillary can easily be filtered off, and in any case can be so reduced in size by increasing the agitation that the particles are harmless. A further safeguard lies in the fact that even slight degradation, as is involved in bleaching, will automatically ensure almost complete solution in the cuprammonium. J. W. B.

PATENTS

Recovering Oil from the Solvent Cleaning or Scouring of Raw Wool or Wool Fabric. R. E. Derby. *USP* 2,607,786

Bleaching Open-mesh Fabrics. International Cellucotton Products Co. *BP* 688,230

Thread slippage, e.g. in gauzes, is avoided by passing the liquor through a roll of the fabric while the roll is rotating under such conditions that it is kept full of the liquor. C. O. C.

VIII—DYEING

Important Developments in 1952. P. J. Wood. *Amer. Dyestuff Rep.*, **41**, 839–840 (8 Dec. 1952).

A brief account of outstanding developments in the fields of fibre production, preliminary processes, dyeing, printing, and finishing. J. W. B.

Direct Cotton Dyes for use above 100° C. E. Herrmann. *Melliand Textilber.*, **33**, 1110–1112 (Dec. 1952).

The effect of dyeing conditions on the stability of dye solutions at temp. > 100°c. is discussed. The nature of the material to be dyed is important—well boiled, bleached cotton has little effect on stability, while raw cotton and some qualities of rayon have a very unfavourable effect. Stability may be improved in many cases by addition of Monochrome Mordant conc. (0·5–1 g./litre). Direct dyes of the Benzo and Sirius ranges are listed in four groups according to their suitability for dyeing above 100°c. A. E. S.

Light Fastness of Direct Cotton Dyeings. H. Hansen. *Z. ges. Text. Ind.*, **54**, 40 (1952): *Textil-Rund.*, **8**, 85–86 (Feb. 1953).

Sirius Supra Yellow RR and RT in mixtures with blue or green dyes, which in self-shades exhibit very good fastness to light (LF), give shades of very poor LF. For good LF the following are recommended—Sirius Supra Green BTL for neutral green; Sirius Supra Olive GL for olive; Sirius Yellow FRRL, R, or RK for shading yellow; Sirius Supra Orange GGL or Sirius Supra Brown BRS for shading red; Sirius Supra Grey VGL or Sirius Supra Blue FBGL for shading blue. Brighter shades are based on Sirius Supra Green BP, which is suitable in artificial light, but its LF is 1·5 units below that of the BTL brand. Up to 20% BB does not markedly influence the LF of BTL. The LF of BB is much affected by most yellows, except Sirius Supra Yellow 5G, Sirius Yellow GG, Benzo Fast Yellow TRL, and Sirius Orange G. These combinations are especially suitable for dischargeable greens, for which Sirius Supra Green BB can be replaced by Sirius Blue 6G. Both are easily reduced and must be dyed from a neutral bath, best in presence of 2% Sustilan N. The light fastness is lowered by aftertreatments which improve the wet fastness and by cationic softeners. Persoftal FA and P are recommended when LF must be maintained. Crease-resisting, when ammonium salts, particularly NH_4NO_3, are used as catalysts, also lowers LF, and a list of dyes which are least affected is given. If $ZnCl_2$ is used as catalyst the LF of almost all dyes is unaffected. H. E. N.

Pad–Steam Process. M. R. Fox. *Dyer*, **108**, 833–836 (12 Dec. 1952).

Discussion of continuous dyeing processes and a description of an all-purpose pad–steam range for the application of vat, sulphur, direct, and disperse dyes. A. H.

Variables affecting Dye Fixation in Padding. A.A.T.C.C. New York Section. *Amer. Dyestuff Rep.*, **42**, P 108–P 115 (16 Feb. 1953).

Laboratory- and full-scale experiments with direct dyes are discussed. Data are given which show the effects of varying the following—cloth pretreatment, padding temperature, treatment of the cloth after padding, drying temperature, dye class (A, B, or C), and additions of solubilising agents to the padding liquor. The fabric used throughout was 92 × 64 pigmented viscose rayon taffeta. Caustic pretreatment yields fuller and brighter dyeings with as good, and in many cases better, fixation than on untreated material. Temperature of padding makes very little difference unless the material is laid up before drying, when better fastness is obtained. Time of storage after padding and before drying is an important factor, long storage at a high padding temperature producing good fixation, and in no instance did immediate drying give a satisfactory result. Temperature of drying had little effect on colour fastness. Diethylethanolamine is very effective in maintaining solution of the dye and permits the laying-up time after padding to be diminished. It is considered, however, that if the storing period can be allowed before drying and the temperature is maintained, satisfactory results can be obtained without a solvent. A. H.

Practical Procedures for Dyeing Cotton and for the High-temperature Dyeing of Synthetic Fibres. A. P. Roy. *Amer. Dyestuff Rep.*, **41**, P 844–P 846 (8 Dec. 1952).

An account of some procedures for dyeing cotton with sulphur, azoic, and vat dyes and for dyeing nylon, Terylene, and Orlon. J. W. B.

Two-colour Effects on Cellulose Acetate–Viscose Rayon Mixtures with Solubilised Vat Dyes. C. T. Speiser. *Textil-Rund.*, **8**, 9–12 (Jan. 1953).

The acetate rayon is dyed for 45 min. with Indigosols in a bath containing sodium formaldehyde-sulphoxylate, Unipan A, and sulphuric acid at 85°c. *Rinsing* removes any dye from the viscose rayon, which is then dyed a contrasting shade from a bath containing Glauber's salt only for 45 min. at 30°c. *Without rinsing*, the dyes on both fibres are then developed, and the process is completed by neutralising and soaping. Lists of suitable dyes are given. H. E. N.

Garment Dyeing. J. K. Collins. *Dyer*, **109**, 243–245 (20 Feb. 1953).

Report of a lecture dealing with garment dyeing. Wool, wool unions, nylon, cotton, viscose rayon, linen, acetate rayon, and natural and tin-weighted silk are covered. Stripping, waterproofing, and stiffening are briefly described. A. H.

Those Red Tunics [Cochineal in the Dyeing of Military Uniforms]. Anon. *Dyer*, **109**, 99–101 (23 Jan. 1953).

Article discussing the pros and cons of acid dyes *versus* cochineal for dyeing army No. 1 dress. A. H.

New Metal-complex Dyes. H. R. Hirsbrunner. *Textil-Rund.*, **8**, 12–21 (Jan. 1953).

A review of Irgalan and Cibalan dyes. Fastness properties—generally equal on wool, silk, nylon, or Perlon; very good light; excellent to most agencies; weakest in acid liquors. Dyeing properties—very uniform; very level strike makes up for poor migration; not salt-sensitive; excellent penetration; cover tippy wool and other irregularities. Dyeing process—control of pH of the bath and of the material is of paramount importance. Nylon and Perlon must be pretreated in trisodium phosphate and soap at 70°c. for 30 min. Levelness is favoured by beginning (i) at a higher pH (7–8); (ii) at a lower temp. (30°c.); and/or (iii) using an agent, e.g. Irgasol DA. H. E. N.

Condensation of Long-chain Fatty Acids with Polysaccharides and Proteins. A. S. Jones, M. A. G. Kaye, and M. Stacey. *J.C.S.*, 5016–5020 (Dec. 1952).

The esterification of D-glucose, D-glucosamine, bacterial dextran, and a somatic polysaccharide with stearic acid is described; and also the condensation of fatty acids with proteins by means of the fatty azide, and by reaction with *p*-phenylenediamine followed by diazotisation and coupling with the protein. H. H. H.

Special Instances of Dyeing Gelatin Layers. K. Chmutov and G. Yushkevich. *Kolloid. Zhur.*, **9**, 309–312 (1947): *Chem. Abs.*, **47**, 948 (10 Feb. 1953).

Gelatin films treated with a perpendicular stream of dye liquor were dyed stronger than those kept in a stagnant liquor. The difference was greater, the weaker the liquor (0·01–1·0%), the shorter the time of dyeing (0·5–20·0 min.), and the greater the affinity of the dye for gelatin. Direct Pink No. 340, Saphirol, Rubinol, and Brilliant Yellow dyed strongly, and Thiocarmine and Methylene Blue weakly. Tanning with chrome alum resulted in stronger dyeing. Coloration of tanned gelatin from a stream of dye liquor had a maximum in 0·01–0·05% soln., whereas coloration from a stagnant liquor increased with dye concn. The results are explained qualitatively by means of the rate of diffusion, which depends on agitation of the liquor and the degree of dispersion of the dye.

C. O. C.

Barotor Pressurised Fabric-dyeing Machine. P. M. Cole. *Amer. Dyestuff Rep.*, **42**, P 32–P 35 (19 Jan. 1953); *Dyer*, **108**, 925–935 (26 Dec. 1952).

The difficulties of obtaining heavy shades on fabrics of nylon, acrylic fibre, and polyester fibre by existing dyeing methods have been overcome by a new pressure dyeing machine, the "Barotor" (DuP). A horizontal autoclave contains a rotor which has a row of bars placed around its periphery and a similar row circumferentially situated near the axis. The inner circle of bars are supported in a series of radial slots, each of which is curved at the end nearest the centre of the rotor. The outer bars are located in slots with a similar curved end at the outer circumference of the rotor. The cloth is threaded round the bars, and, as the rotor slowly turns, the outer bar coming above the axis rolls to the centre of its slot. At the same moment the bar exactly opposite passes below the axis and rolls to the outer end of its slot, thus taking up the slack released by the other bar. In this manner no portion of the cloth is in constant contact with a bar. Bars can be omitted to suit a particular charge of cloth, and loading and unloading are carried out automatically, a magazine being utilised for the inner circle of bars with the outer circle remaining *in situ*. Sampling without loss of pressure is carried out by sewing weighted pattern tabs to the cloth; at the position where gravity compels the pattern to fall free, a hook passes into the machine through a gate valve, and snags the pattern, which is then withdrawn. Photographic illustrations are shown of the machine.

A. H.

Dyeing Fabrics under Pressure. J. E. Reith and R. J. Andres. *Amer. Dyestuff Rep.*, **42**, P 35–P 38 (19 Jan. 1953).

Laboratory experiments on the Barotor machine at 250°F. with disperse, acid, basic, and direct dyes on Terylene, Orlon, and nylon show that better fastness, deeper dyeings, better levelling, shorter dyeing times, and more economical results are obtained than by ordinary dyeing methods at 212°F.

A. H.

Principles of Dyeing Dacron [Terylene] Polyester Fibre. W. R. Remington. *Amer. Dyestuff Rep.*, **41**, 859–860 (22 Dec. 1952).

A brief theoretical account of the difficulties in dyeing Terylene, and how they are overcome in practice by using a carrier, by means of high temperature, or by dye formation *in situ*.

J. W. B.

Thermosol Method of Dyeing New Synthetic Fibres. J. W. Gibson, P. Knapp, and R. J. Andres. *Amer. Dyestuff Rep.*, **42**, 1–2 (5 Jan. 1953).

The Thermosol method of dyeing nylon, Terylene, and Orlon is described. A surface coating of dye is applied to the fibres— loose, top, or fabric— which are dried and exposed to a temp. above 350°F., when the dye penetrates and becomes very fast.

J. W. B.

Copper Dyeing of Polyacrylonitrile by Controlled Redox Potential Method. R. H. Blaker. *Amer. Dyestuff Rep.*, **42**, P 76–P 80 (2 Feb. 1953).

Cuprous ions in the dyebath create in Orlon an affinity for acid dyes. The Cu is added as $CuSO_4$ and reduced *in situ* with hydroxylamine sulphate. It is found that the amount of dye absorbed by the fibre is proportional to the amount of Cu^+ absorbed, and this in turn depends upon the pH, temp., and $[Cu^+]$ of the dyebath. Excess of reducing agent produces metallic Cu and can cause destruction of dye, so that the reduction of the cupric salt must be carefully controlled. This is done by determination of optimum conditions and measurement of the redox potential of the system; subsequently, further additions of reducing agent are controlled in the same manner. Practical dyeing trials are discussed, and a theory is put forward for the bonding of Cu^+ to the cyano groups in the fibre.

A. H.

Dyes for Orlon and their Application. P. L. Meunier. *Amer. Dyestuff Rep.*, **42**, P 39–P 43 (19 Jan. 1953).

Description of techniques for dyeing Orlon 41 with— (1) acid dyes at 212°F. and at 250°F., (2) indigo and selected vat dyes at 212°F., and (3) basic dyes above the boil. The best results are obtained with acid dyes at 250°F. in presence of Cu^+. Satisfactory dyeings have also been produced with indigo using a vat–acid process and with basic dyes at high temperatures.

A. H.

PATENTS

Entering Fabrics into Dyebaths. Celanese Corpn. of America. *USP* 2,604,772

Entering the fabric into the bath between a pair of curtains extending the full width of the fabric and from above the liquor surface to a point below it, the curtains being pressed towards one another and into contact with the fibre, prevents any scum or other impurity on the surface of the liquor from being collected by the fabric.

C. O. C.

Daylight-fluorescent Textiles. J. L. Switzer and R. A. Ward. *USP* 2,606,809

A daylight-fluorescent dye which is more soluble in alcohol than in water is dissolved to a strong solution in aq. alcohol. Fibres, e.g. acetate rayon, which tend to be swollen by aq. alcohol are then dyed in this solution.

C. O. C.

Synthesis and Investigation of Compounds for the "Azoic" Dyeing of Wool (IV p. 166).
Bonded-fibre Fabrics (VI p. 170).
Interfibre Friction of Viscose Rayon (VI p. 171).
X-Ray Studies of the Reaction between Polyvinyl Alcohol and Congo Red (XIII p. 178).
Simple Technique for investigating the Effect of Humidity on the Fading and Degradation of Dyed Cotton Fabrics (XIV p. 180).

IX— PRINTING

New Thickener from Locust-bean Flour. H. Neukom and G. Junghans. *Textil-Rund.*, **8**, 30–33 (Jan. 1953).

This flour contains 90–95% of a hemicellulose, carubin, built up of mannose and galactose. Its ether, marketed as MeyPro-Gum by MeyPro A.G., has the following characteristics— sol. in cold water, resistant to alkali, very flexible and economical.

H. E. N.

Burnt-out Printed Effects. P. Joly. *Rayonne*, **7**, 16–21 (Oct. 1951).

The usual methods, involving acetone, for the local destruction of cellulose acetate rayon on a ground-structure of viscose rayon leave the material stiff because of incomplete reaction. Instead, printing with pastes containing benzoyl peroxide and Dévoral (Rhône–Poulenc), drying, and either baking for 3–5 min. at 120–125°c. or, better, treating with dry steam is advocated. To destroy cellulosic fibres on an acetate ground-structure, pastes containing aluminium chloride or sulphate are used. To destroy acetate and viscose in the presence of animal fibres, aluminium perchlorate is employed. Recipes and precautions are given.

H. E. N.

Ardil and Terylene Prints. A. G. H. Michie. *Dyer*, **109**, 199–207 (6 Feb. 1953).

Ardil–wool mixtures (25 : 75) can be coloured by a wide variety of dyes, but, although the light fastness is generally equal to or slightly better than on pure wool, the fastness to repeated mild washing is inferior. Printing methods are described for acid, direct, chrome, and azoic dyes. Chrome mordant dyes give the best all-round results. For 40 : 60 *Ardil–Fibro* mixtures most dye classes are suitable, and printing methods are given for vat, azoic, mordant, direct, acid, and solubilised vat dyes and for Diphenyl Black. Basic mordant dyes are unsuitable, owing to the staining of unprinted areas on washing off. For *Terylene* disperse dyes, Alcian Blue 8GS, vat dyes, and pigment printing compositions are suitable. In the case of vat dyes the

alkaline leuco compound has little affinity, and a technique using the leuco acid is recommended. High-pressure (40 lb./sq. in.) steaming is required to obtain good fibre penetration, and nitrous acid is used to oxidise the leuco vat dye. A. H.

Printing Acrylic and Polyester Fibres. A.A.T.C.C. Rhode Island Section. *Amer. Dyestuff Rep.*, **42**, P 99–P 107 (16 Feb. 1953).

The following dyes have been investigated on Orlon and Terylene—disperse, acid, premetallised, vat, esters of leuco vat dyes, direct, mordant, azoic, and resin-bonded pigments, and the investigation included normal printing techniques and fabric preparation, fabric pretreatment, use of assistants, heat treatments, high-temperature steaming, use of various pigment binders, swelling agents, aftertreatments, and surface stripping. Extensive data from laboratory and practical plant trials are submitted, and it is confirmed that in the case of acrylic fibre a thorough fabric preparation is necessary, but with polyester fibre the material is easily prepared for printing. Laboratory trials show that Orlon can be printed with—selected acid dyes and pressure steaming, disperse dyes and pressure steaming, Aridye pigments, vat pigments, and vat acids in ethyl cellulose emulsions. Practical plant trials confirm that Aridye pigments, vat pigments, and vat acid dyes produce prints of excellent light and wash fastness and fair to very good wet and dry rubbing fastness. To prevent shrinkage of Terylene during processing the fabric must be pre-heat-set to 450°F. on a stenter frame. Laboratory trials produced satisfactory results on Terylene with—disperse dyes and pressure steaming, Aridye pigments, vat dyes as pigments, vat acids in ethyl cellulose emulsions, and esters of leuco vat dyes in ethyl cellulose. Plant trials produced good results with Aridye, vat pigments, vat acids, and leuco vat esters followed by heat treatment at 425°F. for 3 min. A. H.

Pigment Printing. K. K. Patni and S. R. Ramachandran. *J. Sci. Ind. Research* (India), **11 B**, 191–197 (1952): *Chem. Abs.*, **47**, 1405 (10 Feb. 1953).

The brightness and fastness properties of prints obtained by using cashew-nut shell liquid resin as the binder are comparable to those where urea–formaldehyde and glyptal resins are used as binders. Incorporation of ethyl cellulose improves fastness to rubbing. The pastes can be diluted with water. C. O. C.

Photoinsolubilisation of Dextran. F. G. Pautard. *Nature*, **171**, 302–303 (14 Feb. 1953).

Dextran and degraded polysaccharides, produced by *Leuconostoc mesenteroides*, are capable of being photo-insolubilised, and a relation apparently exists between molecular size, expressed as viscosity, and light sensitivity. Preparations having mol. wt. $> 10^6$ show a greater speed of insolubilisation than those of mol. wt. $< 5 \times 10^5$. Preparations with mean mol. wt. ca. 3×10^5 show rates comparable with proteins conventionally used in photo-mechanical engraving processes. Variation of the sensitising dichromate concn. does not affect the general sensitivity of these dextrans to any marked degree. After being heated for 2 min. at 250°C. the insol. image is resistant to etching acids. J. W. B.

PATENTS

Printing with Basic Dyes. A. Messerli. *BP* 686,231

The water-insoluble salts formed by basic dyes with aliphatic carboxylic acids are very suitable for flat printing on cloth. They are used together with fatty binding agents. On steaming, these salts are split up, and the dye is absorbed by the fibres to give deep bright prints of satisfactory fastness to washing and rubbing. C. O. C.

Glass Colour Vehicle. DuP. *USP* 2,607,701

A vehicle for a mixture of inorganic pigment and finely ground glass used for decorating ceramics and metals consists of wax or a wax-like material of m.p. 120–212°F. (20–98%), ethyl cellulose (2–15%), rosin or rosin derivative (0–55%), and lecithin or phosphorated tall oil (0–20%). The product is suitable for application by screen printing. *USP* 2,607,702

A vehicle consisting of stearic acid (30–60%), stearyl acid phosphate (2–7%), ethyl cellulose (0·1–10·0%), hydrogenated rosin (15–40%), and "poly-pale" resin (10–30%). Poly-pale resin is obtained by polymerising the unsaturated resin acids found in rosin. This will give an ink which may be applied at 47–100°C. by screen printing and which dries almost immediately the stencil is removed. C. O. C.

Diazotype Printing. General Aniline. *USP* 2,606,117

Incorporating a lustrous powdered metal pigment into the diazotype layer results in prints having open shadows and softened highlights. C. O. C.

Important Developments in 1952 (VIII p. 173).

X—SIZING AND FINISHING

Sizing of Rayon Warps with Linseed Oil. J. Pinte, Mlle Essertel, and P. Rochas. *Bull. Inst. Text. France*, (34), 15–22 (Aug.); (35), 25–49 (Oct. 1952).

Optimum conditions for the application of linseed oil size are described. Amongst the factors discussed are temperature of drying, quantity of size on the fibres, filament fineness, and the effects of delustrant and residual sulphur. In order to reduce loss in the degree of polymerisation of the cellulose during drying and storage, experiments were made with modified linseed oils. It is claimed that boiled oil containing about 0·01% of a suitable organic antioxidant and dried for 40 hr. at 45°C. will yield a satisfactory size possessing good resistance to degradation during storage. G. L.

Sizing of Polyamide Fibres with Polymeric Acrylates. H. Moroff. *Textil-Praxis*, **8**, 143–145 (Feb. 1953).

Sizing of nylon and Perlon with water-soluble acrylic polymers, e.g. Acrytex (Röhm & Haas), at pH 3·2–3·5 gives yarns which do not show any tendency to stick even at high humidities. Sizing is best carried out at 55–60°C., and the warps are air-dried at 70–75°C.; if roller driers are used, the temp. of the middle roller should not exceed 80°C. and that of the other two 50–60°C. Desizing can be carried out at 40–50°C. with water alone, or can be combined with scouring in a soda or ammonia solution (approx. 2 g./litre) together with soap or a detergent. B. K.

Sizing Orlon and Terylene Staple. W. C. Wylie. *Amer. Dyestuff Rep.*, **42**, P 11–P 13 (5 Jan. 1953).

Skeins of Orlon and Terylene staple fibre are sized with polymeric sizing agents, including polymethacrylic acid, polyvinyl alcohol, polyacrylic acid, sodium alginate, and methyl vinyl ether–maleic anhydride copolymer. Sizing efficiency is judged by the breaking and fuzzing resulting from strokes on a cohesion tester. Size mixtures used are much more effective on Orlon than on Terylene, the best size for Orlon containing approx. 13% polyvinyl alcohol and 2% sodium alginate. Results with Terylene, though less efficient, are similar. J. W. B.

Alkarylsulphonates as Conditioners in Wet-twisting Cotton Tyre Cord. J. C. Ambelang, J. A. Shotton, G. W. Gottschalk, H. P. Stevens, and G. E. P. Smith. *Ind. Eng. Chem.*, **45**, 204–210 (Jan. 1953).

Wet twisting of cotton tyre cords treated with solutions of sodium alkylnaphthalenesulphonates containing > 13 alkyl C atoms produced a significant increase in the breaking strength of the cord. Treatments with similar products containing < 12 alkyl C atoms were much less effective. Similar results were observed with alkylbenzene- and alkylphenol-sulphonates. There was no correlation between cord strength and wetting efficiency, and most other wetting agents produced little improvement in cord strength. The more suitable sulphonates tended to be oil-soluble and to be derived from hydrocarbons of high aniline point (high mol. wt.). The development of greater breaking strength without loss in elongation is attributed to the physical characteristics of the higher sulphonates, which are considered to exert a bonding action on the cotton fibres. W. K. R.

High-frequency Drying in the Rayon Industry. R. van Nes. *Symposium on "The Physics of Fibrous Materials"* (Arnhem: Dutch Physical Society, 1950), pp. 95–103.

Rayon rolls and cakes are placed with the hollow part at right angles to the electrodes of a condenser connected to a high-frequency A.C. generator. Rapid and homogeneous drying is obtained. W. R. M.

Textile Odours and Deodorants. A.A.T.C.C. Northern New England Section. *Amer. Dyestuff Rep.*, **42**, P 67–P 69 (2 Feb. 1953).

Brief discussion of odorous substances used in textile processing and suggestions for mitigating the odours,

followed by description of experiments in which cotton, wool, and nylon are impregnated with various substances and then deodorised. Odorous substances tested are—citral, Texodor (floral), Texodor (vanillin), pine oil, trimethylamine, pyridine, oil of garlic, cheese (butyric), and butyric acid. Deodorants studied were Na Cu chlorophyllin and Na Cu chlorophyllin + HCHO. A. H.

Bacterial Damage of Textiles. M. Nopitsch. *Z. ges. Text. Ind.*, **54**, 610 (1952): *Textil-Rund.*, **8**, 41 (Jan. 1953).

Conditions suitable for development of bacteria are discussed, humidity, temp., and pH being important. The main types of bacteria which attack wool are listed, and a method for testing the resistance of wool to bacteria is described. Protection can be obtained with chrome, Eulan, salicylic acid and deriv., and simple and chlorinated phenols. Casein and the pectin of vegetable fibres may also be attacked by bacteria. Purely cellulosic fibres can be affected both by aerobic and by anaerobic bacteria, but damage by fungi is far more important. H. E. N.

Avcoset Stabilisation of Rayon Fabrics. I. H. Welch and J. A. Woodruff. *Amer. Dyestuff Rep.*, **41**, P 880–P 884 (22 Dec. 1952).

A brief survey of resin treatments for rayon fabric stabilisation is followed by a description of the Avcoset process, which utilises an agent mainly comprising an alkali-soluble cellulose ether and formaldehyde. Stabilisation to several washings is given without danger of tendering; there is no retention of chlorine from chlorine-containing liquors, as may happen with nitrogen-containing stabilisers. J. W. B.

Urea–Formaldehyde Kinetic Studies. III—Polarographic Studies in Dilute Solution. L. E. Smythe. *J. Amer. Chem. Soc.*, **75**, 574–576 (5 Feb. 1953).

A study of the reaction between (*a*) urea, (*b*) *N*-methylurea, (*c*) *N*-ethylurea and H·CHO in dil. soln. at pH 7·15, the polarographic method being used to follow the concn. of unchanged H·CHO. The method is described in detail, as it is suitable for following the course of industrially used condensations. The diffusion current in the selected buffer, although reduced, was adequate to give smooth polarographic steps, few of which showed maxima. Thus the use of maximum suppressors was avoided. The reactions were of second order, and rate constants and energies of activation were evaluated. Differences exist between the use of urea with H·CHO and of the simple *N*-alkylureas with H·CHO. It seems that with alkylureas some effective resonance stabilisation is lost, and the effect becomes more pronounced in dil. soln., resulting in increased reactivity. Hydration of both urea and H·CHO is appreciable at about pH 7, the reactions reaching a certain stage and being unable to proceed further. The effect of acid or alkaline catalysts in dil. soln. would be initially to break down forces of hydration, and in the case of alkaline catalysts the reaction is reversible. C. O. C.

Weather-, Water-, Wash-, and Flame-proof Finish, and the Testing thereof. K. Quehl. *Melliand Textilber.*, **33**, 1115–1116 (Dec. 1952); **34**, 69–71 (Jan.), 143–145 (Feb. 1953).

The disadvantages of some existing flameproofing treatments for cotton fabric are discussed, and it is claimed that a flameproof finish that is fast to washing at the boil is obtained by the application of Aflamman extra N or NW (Dr. Quehl & Co. G.m.b.H.) by a simple padding and drying technique. The fabric acquires increased tensile strength and a considerable measure of waterproofness, which may be increased further by an aluminium formate aftertreatment. Testing methods are discussed. A. E. S.

PATENTS

Increasing the Tensile Strength of Cotton Yarn or Cord. B. F. Goodrich Co. *USP* 2,606,844

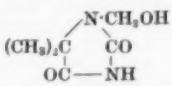
Impregnation with a solution of a rosin amine salt of a weak organic acid, e.g. rosin amine acetate, followed by drying under tension imparts to cotton increased tensile strength and produces better adhesion between the treated cotton and rubber. C. O. C.

Dimensional Stabilisation of Regenerated Cellulose. American Viscose Corpn. *BP* 688,135

Fabrics consisting predominantly of regenerated cellulose are impregnated with an aqueous solution or dispersion containing an alkaline substance, e.g. NaOH, a water-insoluble alkali-soluble cellulose ether, and a saturated aliphatic aldehyde or a water-soluble liquid condensate of such an aldehyde with a saturated aliphatic ketone. The fabrics are then dried and baked, if desired after treatment with acid to coagulate the cellulose ether, in which case baking is carried out at 260°F. instead of 280°F. The treated fabric is dimensionally stable when laundered. C. O. C.

Dimensional Stabilisation of Cellulosic Textiles. L. Beer. *BP* 687,856

Materials of natural and/or regenerated cellulose, which may also contain > 50% of cellulose acetate, are impregnated with an aq. soln. of *N*-hydroxymethyl-5:5-dimethylhydantoin—



and/or dimethylhydantoin–formaldehyde, dried, baked at 120–150°C., neutralised, and rinsed. The solution should contain 0·2–1·5% of available active H·CHO and be brought to pH 2·0–2·5 by adding a non-volatile organic acid. The treated materials are dimensionally stable even when washed repeatedly at the boil. C. O. C.

Upholstery Material from Agglutinated Artificial Filaments. Vereinigte Glanzstoff-Fabriken. *BP* 688,315

Upholstery material is continuously produced from freshly extruded monofilaments (artificial horsehair), which are gathered into a cable. This is predried and then overtwisted, the crimp fixed by further drying, and the cable loosened to form a crimped band of parallel crimped threads. It is sprayed with a binder which remains elastic after drying and/or vulcanisation, e.g. rubber latex emulsion, and a number of bands are superposed and pressed together. Vulcanisation then produces a band which can be cut to desired sizes. *BP* 688,514

Before drying or vulcanisation, the crimped band is imprinted with fold lines which make it possible simply to fold the band about any subsequent insert, e.g. steel springs. After vulcanisation, rectangular cut-outs are stamped at the edges. J. W. B.

Reducing the Felting Property of Wool. Tootal Broadhurst Lee Co. *BP* 686,104

When materials containing wool are being treated with an alkali dissolved in an organic liquid so as to reduce their tendency to felt, the resistance of the wool to abrasion when wet can be improved by treating the materials with formaldehyde before, during, or after the treatment with alkali. C. O. C.

Reducing the Felting Properties of Wool. American Cyanamid Co. *USP* 2,606,810

Wool treated with a monomer of formula—

$$R^1{\cdot}CH{:}CR^2{\cdot}CO{\cdot}O{\cdot}CH_2{\cdot}CH{:}CH_2$$

(R^1 = H or CH_3; R^2 = CH_3 when R^1 = H, and H when R^1 = CH_3) or partly polymerised compositions containing, by wt., a monomer as above (3–100%) and a compound containing a single $CH_2{:}C\diagdown$ group, e.g. ethyl acrylate, and then heat-cured has its felting power greatly reduced while retaining a soft handle. The finish resists laundering. C. O. C.

Setting of Nylon Fabric. British Nylon Spinners. *BP* 686,451

The fabric, while being maintained at the desired dimensions, is treated with a hot gas in absence of oxygen and water vapour, the gas being one which remains gaseous at ordinary atmospheric temperature and pressure, e.g. carbon dioxide or nitrogen. C. O. C.

Water-repellent Finish. Dow Corning. *BP* 686,212

Fabrics made from fibres of all kinds are rendered water-repellent by being impregnated with a mixture containing by wt. 15–45% of a liquid of formula $(CH_3)_aH_bSiO_{(4-a-b)/2}$ (a = 1·0–1·5; b = 0·75–1·25; $a + b$ = 2·0–2·25), 10–30% of a liquid methyl polysiloxane containing 2·0–2·1 CH_3 radicals per Si atom and of viscosity 1,000–100,000 centistokes, and 20–65% of a compound of formula $(CH_3)_xSiO_{(4-x)/2}$ (x = 1·0–1·25) and then heated at 100–475°F. for 5 sec.–1 hr. This treatment does not render cotton materials too soft nor does it cause acetate rayon,

nylon, or other smooth fibres to become too slippery. The fastness to washing of the water-repellent finish produced on cotton is good. C. O. C.

Fireproof, Waterproof, Flexible Sheeting resistant to Penetration by Vesicants. U.S. Secretary of War. *USP* 2,606,131

Fabric or paper is coated with a composition made up of a proteinaceous material and an ammonium alkyl- or alkylamino-phosphate together with a plasticiser and a solvent. C. O. C.

Coating Nylon Fabrics with Polyvinyl Chloride. DuP. *USP* 2,606,845

Good adhesion is obtained if the nylon fabric is first coated with a modified polyamide, soluble in 80–95% ethanol, prepared according to *USP* 2,430,860. C. O. C.

Patterned Pile Material. Dunlop Rubber Co. *BP* 687,982

A backing material is coated with an adhesive, which is then rendered ineffective in those parts where no pile is required. Fibres are distributed over the coated surface, and then anchored to the parts of the coating which retain their adhesive property. C. O. C.

Water-repellent Vapour-permeable Glass Fabric. Owens-Corning Fiberglas Corpn. *USP* 2,604,688

Treating the glass fibres before or after they have been formed into fabric so as to render them water-repellent results in fabrics which are vapour-permeable although water-repellent. C. O. C.

Bonded-fibre Fabrics (VI p. 170).

Interfibre Friction of Viscose Rayon (VI p. 171).

Important Developments in 1952 (VIII p. 173).

XI—PAPER AND OTHER CELLULOSIC PRODUCTS

Physical Properties of Paper Pulps. I—Elastic Properties of Wet Mats of Papermaking Fibres. G. N. Christensen and W. W. Barkas; **II—"Freeness" of Paper Pulps and the Forces of Capillary Water Retention.** R. Hallan and W. W. Barkas. *Nature*, **171**, 165–166; 166 (24 Jan. 1953).

I—On draining suspensions of papermaking fibres, small cylinders are formed which retain their structure up to moisture contents of ca. 1000%. The changes in dimension with changes in hydrostatic tension are measured, up to the point where little further drying occurs owing to air being sucked through rather than water. Considerable hysteresis is found between sorption and desorption curves.

II—The porous plate technique is considered to be of importance in giving a measure of the "wetness" or "freeness" of beaten paper pulps in exact thermodynamic terms, thus leading to precise information on the properties of wet paper web under the conditions of manufacture. J. W. B.

Carbonyl Oxycelluloses. W. M. Corbett, J. Kenner, and G. N. Richards. *Chem. and Ind.*, 154 (14 Feb. 1953).

An oxycellulose containing carbonyl groups can be regarded as both an α- and a β-alkoxyketone. Oxidation of 1:3-dimethoxypropan-2-one and 1-hydroxy-3-methoxypropan-2-one by Ag_2O in NaOH soln. indicates that the reducing power of the grouping –CH(OH)·CO– is likely to be subordinate in an oxycellulose to that of CO·CH·O·C<. α-Alkoxyketones are more stable to alkali than oxycelluloses, but β-alkoxycarbonyl compounds pass easily into $\alpha\beta$-unsaturated ketones. The behaviour of oxycelluloses towards alkali is interpreted in this sense. Experiments with appropriate disaccharides yield results in agreement with these views. W. R. M.

Preparation and Properties of Ether and Ester Derivatives of Hydroxyethyl Cellulose. S. G. Cohen, H. C. Haas, L. Farney, and C. Valle. *Ind. Eng. Chem.*, **45**, 200–203 (Jan. 1953).

The preparation is described of ethers (*n*-propyl, *n*-butyl, *n*-hexyl, benzyl) and esters (acetate, propionate, butyrate, benzoate) of hydroxyethyl celluloses containing 0·4 and 1·5 mol. of combined ethylene oxide per anhydroglucose unit. Hydroxyethyl cellulose undergoes substitution reactions more readily than cellulose. Information is given regarding the degree of substitution of the various preparations, their solubilities, and their film properties. W. K. R.

Esterification of Cellulose with Benzenesulphonyl Chloride in Pyridine. I. V. Nemilova. *J. Appl. Chem. U.S.S.R.*, **25**, 1107–1108 (Oct. 1952).

Cellulose esters containing about two phenylsulphonyl groups per glucose residue are obtained by the action in the cold of benzenesulphonyl chloride on regenerated cellulose suspended in pyridine. The products contain ~1% Cl. A. E. S.

Esterification of Methyl Cellulose of Low Methyl Content with *p*-Toluenesulphonyl Chloride in Pyridine. I. V. Nemilova. *J. Appl. Chem. U.S.S.R.*, **25**, 1324–1326 (Dec. 1952).

Prior methylation (4·5–10% $O{\cdot}CH_3$) facilitates the reaction of cellulose with *p*-toluenesulphonyl chloride in pyridine. Products of composition corresponding approx. to 1 $O{\cdot}CH_3$ and 4 $O{\cdot}SO_2{\cdot}C_6H_4{\cdot}CH_3$ per 2 glucose residues are soluble in pyridine and in acetone. A. E. S.

PATENTS

Tub-sizing of Paper. J. Knaggs. *BP* 688,764

To improve its dry and wet strength, paper is immersed in an aqueous solution of partly hydrolysed polyvinyl acetate containing gelatin, a hardening agent, e.g. alum, melamine in acetic or hydrochloric acid, and a soluble aldehyde. The partly hydrolysed polyvinyl acetate may contain about 20% unchanged polyvinyl acetate, or may be replaced in part by polyvinyl alcohol. S. V. S.

Artificial Leather and Skin. Central Adarnas. *BP* 688,751

A process for the manufacture of artificial leather and skin comprises subjecting to a disintegrating action a fibrous material having a cellulose basis, e.g. cellulose pulp from wood waste or rags, until its fibres are completely separated and at the same time treating it with substances, e.g. $ZnCl_2$, NH_4CNS, which will enhance its tendency to unite with binding agents. The material is mixed with binders (10–65% of the dry material), e.g. rubber, rubber latex, polyvinyl acetate, which are then precipitated from suspension or emulsion with e.g. aluminium sulphate, the resulting pulp being filtered, pressed into the required shape, and dried. J. W. B.

Processing Molten Cellulose Derivatives into Threads and other Shaped Articles (VI p. 172).

Condensation of Long-chain Fatty Acids with Polysaccharides and Proteins (VIII p. 173).

Fireproof, Waterproof, Flexible Sheeting resistant to Penetration by Vesicants (X this page).

XII—LEATHER; FURS; OTHER PROTEIN MATERIALS

Raw Materials of Life. D. P. Riley and U. W. Arndt. *Nature*, **171**, 144–145 (24 Jan. 1953).

A brief survey of X-ray analysis of proteins and of theories on the interpretation of results is followed by an appeal for specimens of proteins and modified proteins which will be analysed by the X-ray method as part of a survey of natural proteins (cf. p. 160). J. W. B.

Structure of Collagen. III—Stress-Strain Behaviour of Thermally Contracted Formaldehyde-tanned Collagen. N. M. Wiederhorn, G. V. Reardon, and A. R. Browne. *J. Amer. Leather Chem. Assocn.*, **48**, 7–20 (Jan. 1953).

The elastic properties of collagen, obtained from kangaroo tails, tanned with formaldehyde at various pH values, and then thermally contracted, are studied in terms of the kinetic theory of rubber elasticity. It is shown that formaldehyde introduces a maximum of 2–3 cross-links per fundamental collagen unit (mol. wt. ca. 55,000), that only 12–50% of the side-chain amino groups take part in the cross-linking, and that those which do take part react preferentially with the formaldehyde. The relation between shrinkage temperature and cross-linking is discussed, and it is shown that increase in hydrothermal stability follows directly from the cross-linking reaction. J. W. B.

Neutral Salt Effect in Chrome Tanning. S. G. Shuttleworth. *J. Soc. Leather Trades Chem.*, **36**, 390–393 (Dec. 1952).

Arguments are presented in support of earlier work on the effect of neutral sulphates on chrome fixation by collagen from solutions of basic chromium sulphate (idem, *ibid.*, **36**, 34 (1952)) and in opposition to criticisms by K. H. Gustavson (*ibid.*, **36**, 284 (1952)). J. W. B.

Isoelectric Point of Chrome-tanned Collagen. S. G. Shuttleworth and G. E. Cunningham. *J. Amer. Leather Chem. Assocn.*, **47**, 660–663 (Oct. 1952).

A general equation is given for the influence of chrome tannage on the isoelectric point of collagen, and it is shown that the isoelectric point may be raised or lowered according to the charge on the chromium complex coordinated to the protein carboxyl groups. The effects of washing, drying, and complex-forming buffers are explained. Results support the conclusion of Gustavson (*ibid.*, **47**, 425 (June 1952)) that the amino groups of the side-chains do not coordinate with chromium under the pH conditions of chrome tannage, but they do not agree with his suggestion that the hydroxyl groups of hydroxyproline and serine can coordinate. J. W. B.

Reactions of Polyamides with Tanning Agents. I—Evidence for the Fixation of Non-ionic Chromium Complexes by the Peptide Groups of Collagen. K. H. Gustavson and B. Holm. *J. Amer. Leather Chem. Assocn.*, **47**, 700–711 (Nov. 1952).

Evidence is provided for participation of carboxyl groups of collagen in the binding of non-ionic Cr complexes. The copolymer from adipic acid–hexamethylene salt (60%) and caprolactam (40%) is precipitated from a methanol soln. of Igamid 6A (Basf) to provide an accessible and reactive form (rather like hide powder) for investigating reactions involving coordination on peptide groups. Fixation of tanning agents and Cr compounds is studied, and it is found that dilute and moderately conc. soln. of Cr compounds of acidities $> 60\%$, containing mainly electropositive Cr complexes, do not react, nor do they react with collagen containing carboxyl blocked by esterification. For this type of chrome fixation carboxyl groups are essential; from conc. soln. and from soln. of highly basic chlorides and perchlorates of Cr, containing preponderantly non-ionic complexes, a considerable amount of Cr is fixed, which shows that in this case peptide (CO·NH) groups are involved. If the basic salts are treated with Na phthalate or Na sulphate to give non-ionic and anionic complexes, there is heavy fixation by the collagen. J. W. B.

Non-specific Precipitation of Proteins by Polyhaptenic Dyes. J. L. Morrison. *Nature*, **171**, 346–347 (21 Feb. 1953).

Bovine γ-globulin and human serum albumin give ppt. with 2-methyl-4:6-di(*p*-arsonophenylazo)phenol (I) and 1:3-dihydroxy-2:4:6-tri(*p*-arsonophenylazo)benzene (II), from pH 3·72 to pH 0·2–0·3 above the isoelectric points of the proteins and in sodium acetate–acetic acid buffer of ionic strength either 0·20 or 0·10. In serial dilution experiments the amount of protein pptd. increases to a max., suggesting that pptn. is due to formation of a framework. The number of combining groups per γ-globulin is calc. to be 44 for I and 36 for II; for albumin the value is 22 with I. At pH 5·0–5·4, at which neither I nor II forms a ppt. with albumin, the presence of albumin greatly decreases the pptn. of γ-globulin by these dyes. J. W. D.

Formyl as a Protective Group in Peptide Synthesis. S. G. Waley. *Chem. and Ind.*, 107–108 (31 Jan. 1953).

Formyl can be removed from *N*-formyl-amino acids and -peptides by cold dil. alcoholic acid; in examples chosen, including one in which the parent peptide (glycylleucine) is readily hydrolysable by acid, peptide-bond fission does not occur. For peptide synthesis benzyl esters are preferred to methyl esters, HCl in benzyl alcohol being employed to effect deformylation. An example of the procedure is—*N*-formyltyrosine, prepared by adding acetic anhydride to tyrosine in formic acid, is *O*-acetylated and condensed with the benzyl ester of *N*-ε-carbobenzyloxylysine to give the benzyl ester of *O*-acetyl-*N*-formyl-L-tyrosyl-ε-carbobenzyloxy-L-lysine, which is treated with 0·5 N-HCl in benzyl alcohol to yield the benzyl ester of L-tyrosyl-ε-carbobenzyloxy-L-lysine hydrochloride, and this is reduced to L-tyrosyl-L-lysine free from tyrosine and lysine. J. W. B.

PATENT

Tanning Agents. FBy. *BP* 688,343

The water-soluble sulphonic acids of sulphodepsides containing sulphone groups are particularly astringent tanning agents, and yield bright leathers of great fullness and good affinity for dyes. C. O. C.

Compound Helical Configurations of Polypeptide Chains—Structure of Proteins of the α-Keratin Type (VI p. 171).

Condensation of Long-chain Fatty Acids with Polysaccharides and Proteins (VIII p. 173).

XIII—RUBBER; RESINS; PLASTICS

Morphology of Crystalline Synthetic Polymers. A. Keller. *Nature*, **171**, 170–171 (24 Jan. 1953).

Polythene and polyamide melts are crystallised in thin layers between cover glasses at a constant temp. within 20°C. of the softening point. On being viewed between crossed Nicols, spherulites are seen which show a system of concentric extinction rings; polythene spherulites show negative birefringence, and polyamides nearly always positive. An illustration is given of a suggested helical structure with the corresponding refractive indices. Support for this view is given by X-ray evidence, provided from a spherulite of polyhexamethylenesebacamide, which indicates that the planes containing the hydrogen bonds are parallel to the radius, the molecules being arranged tangentially. J. W. B.

Effect of High-energy Radiation on Long-chain Polymers. A. Charlesby. *Nature*, **171**, 167 (24 Jan. 1953).

Polythene, polystyrene, Terylene, nylon, and unvulcanised rubber become cross-linked when subjected to high-energy radiation from the Harwell B.E.P.O. pile; methyl methacrylate starts to decompose after a very short irradiation period. The degree of cross-linking is proportional to the radiation dose over a wide range of values, and thus it is possible to prepare specimens with any degree of cross-linking without heat treatment or introduction of other atoms. Principal attention is given to polythene, and the results are described in some detail. J. W. B.

Thermodynamics of Polymer Solutions. H. Tompa. *Sitzungsber. Öster. Akad. Wiss. IIb*, **161**, (10), 1356–1368 (1952).

A critical discussion comparing recent experimental results with theories based on statistical mechanics. Desirable further work is indicated. 35 references. H. E. N.

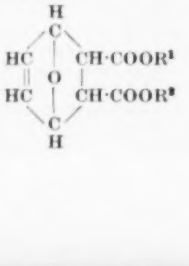
X-Ray Studies of the Reaction between Polyvinyl Alcohol and Congo Red. N. Okada and I. Sakurada. *Bull. Inst. Chem. Research, Kyoto Univ.*, **26**, 95 (1951): *Chem. Abs.*, **47**, 1423 (10 Feb. 1953).

Polyvinyl alcohol is precipitated from aq. soln. by Congo Red. In a 1·5% Congo Red soln. gelation occurred, while in 3% soln. syneresis took place. Changes in X-ray diagrams from this concn. showed the strongest interference corresponding to the spacing of 4·21 A. Immersion of polyvinyl alcohol films or filaments in Congo Red soln. gave similar results; they became plastic and could be drawn to several times their original length. These products showed three new interferences in the meridian, the spacings being 13·25, 8·80, and 6·54 A. respectively. The fibre period calculated from these spacings is 26·4 A. These spacings were assumed to belong to a complex between polyvinyl alcohol and Congo Red. C. O. C.

PATENTS

Light-stabilised Vinylidene Chloride or Vinyl Chloride Compositions. Dow Chemical Co. *BP* 688,513

Compounds of formula—



(R^1 and R^2 = hydrocarbon radicals) stabilise vinylidene or vinyl chloride compositions to light and to ultraviolet radiation. C. O. C.

Nitrogenous Thermosetting Resins. Röhm & Haas Co. *USP* 2,605,253

The products obtained by the interaction of urea, formaldehyde, and dimethylamine are cationic resins, which even when very highly condensed are very soluble in water. C. O. C.

Coating Sheet Material. DuP. *BP* 688,637

A molten film of a normally solid synthetic linear polymer of sharp m.p., e.g. obtained by interpolymerising hexamethylenediammonium adipate (40 parts by wt.), hexamethylenediammonium sebacate (30), and caprolactam (30), is extruded, whilst still molten, into contact with the sheet to be coated and pressed against the sheet, the surface of the film remote from the sheet being cooled to below the solidification point, e.g. by passing through rollers one of which is chilled. The process may be applied both to producing coatings with high adhesion to the sheet and to producing low-adhesion coatings on thin foils which may later be stripped away to give transparent films useful for packaging. J. W. B.

Urea–Formaldehyde Kinetic Studies. III— Polarographic Studies in Dilute Solution (X p. 176).
Artificial Leather and Skin (XI p. 177).
Reactions of Polyamides with Tanning Agents. I— Evidence for the Fixation of Non-ionic Chromium Complexes by the Peptide Groups of Collagen (XII p. 178).

XIV— ANALYSIS; TESTING; APPARATUS

Fifth Annual Review of Analytical Chemistry. *Anal. Chem.*, **25**, 2–74 (Jan. 1953).

Eleven individual headings include— coatings, pesticides, natural and synthetic rubbers, and water. These four sections include, respectively, 138, 129, 302, and 183 references to the literature. J. W. D.

Recent Developments in Quantitative Organic Microanalysis. W. Kirsten. *Anal. Chem.*, **25**, 74–86 (Jan. 1953).

Particular reference is made to instrumentation in the determination of elements. There are 62 references to the literature. J. W. D.

Determinations of Size of Particles with the Electron Microscope. E. Atherton. *Nature*, **171**, 350–351 (21 Feb. 1953).

The particle size of textile-bonding agents, which are dispersions of spherical polymer particles of size range 0–0·2 μ., has been determined by a modification of Timbrell's method (*ibid.*, **170**, 318 (1952)). Photographs of the dispersion are projected by means of an ordinary slide projector, and the beam is directed on to a screen by means of a front-aluminised glass mirror which can be oscillated about a vertical axis. Each overlapping area on the screen represents a particle of diameter > the amplitude of the oscillation. By varying the amplitude control, cumulative size–distribution curves are obtained. A Perspex disc, one half of which is dyed red and the other green, is placed in front of the projector and rotated in synchronisation with the oscillation of the mirror. Overlaps are thus easily visible as bright yellow areas. Details of the apparatus are given. J. W. D.

Device for Counting Small Particles suspended in a Fluid passing through a Tube. P. J. Crosland-Taylor. *Nature*, **171**, 37–38 (3 Jan. 1953).

A wide tube may allow two (or more) particles to pass abreast across a particular section, whilst narrow tubes block easily and lead to difficulties in observation arising from refractive index differences between tube and suspending fluid. A method is described and illustrated whereby a suspension of particles may be injected slowly into a faster stream of fluid flowing in the same direction. If there is no turbulence, the particles are accelerated to form a narrow column surrounded by a fluid of the same refractive index, which in turn is enclosed in a tube which will not interfere with observation of its axial contents. The particles may be counted electronically. J. W. D.

Determination of Milligram and Submilligram Quantities of Copper. K. Tantranon and B. B. Cunningham. *Anal. Chem.*, **25**, 194–195 (Jan. 1953).

The adaptation to each of four scales (5 mg., 1 mg., 50 μg., and 20 μg.) of the method of Jamieson, Levy, and Wells (*J. Amer. Chem. Soc.*, **30**, 760 (1908)), in which cuprous thiocyanate is oxidised by iodate in conc. HCl—

$$4CuCNS + 7IO_3^- + 14H^+ + 14Cl^- = 4Cu^{2+} + 7ICl_2^- + 4SO_4^{2-} + 4HCN + 5H_2O$$

Until sufficient iodate has been added to complete the reaction, the soln. contains free iodine, which may be detected by the colour imparted to a small amount of $CHCl_3$ added to the soln. The disappearance of this colour represents the end-point. The details are given and the accuracy is indicated of each of the four scalings of the method. J. W. D.

Extraction of Aluminium Soaps with Acetone. K. J. Mysels, H. H. Pomeroy, and G. H. Smith. *Anal. Chem.*, **25**, 173–174 (Jan. 1953).

When an aluminium soap is extracted with anhyd. acetone, only free acid is removed. Normally acetone contains ~ 0·3% moisture, and this is enough, in 1 litre of acetone, to hydrolyse 37 g. of a soap such as the hydroxydilaurate. Free and bound acid is removed quite rapidly by normal acetone, which then slowly hydrolyses the soap at a rate which increases with the temp. of extraction; carefully dried acetone and a low temperature of extraction are thus recommended to minimise the hydrolysis. It is shown how, by extrapolation of experimental data to zero time and zero rate of hydrolysis, the composition of the original unhydrolysed soap may be obtained. J. W. D.

Photometric Determination of Silica in Alkalis. O. A. Kenyon and H. A. Bewick. *Anal. Chem.*, **25**, 145–148 (Jan. 1953).

The molybdenum blue complex is formed under specified conditions and is measured photometrically. The method, which is applicable over a wide range of silica concn., is rapid and accurate, and a standard deviation of ±0·9 μg. in 100 μg. of silica is realisable. Interference of phosphate is suppressed by citric or tartaric acid, and under the conditions of the determination there is no interference from comparatively large quantities of ferric iron, $NaNO_3$, Na_2SO_4, and $NaClO_3$. Samples are neutralised with 10 N-HCl, and the pH is then adjusted with silica-free ammonia, thus permitting const. chloride content during colour development (an important factor). The method, which must be closely followed, is fully described. J. W. D.

Titration of Phenols in Non-aqueous Solvents. J. S. Fritz and R. T. Keen. *Anal. Chem.*, **25**, 179–181 (Jan. 1953).

Most phenols with negative substituents are sufficiently acidic to permit titration in dimethylformamide with potassium methoxide, using azo violet as visual indicator. Phenol and alkyl-substituted phenols are weaker acids, but can be titrated in ethylenediamine, *o*-nitroaniline being used as indicator. Some phenols cannot be so titrated, owing to deep colour formation during the titration; with *p*-hydroxybenzoic acid, a heavy ppt. forms, causing a fading end-point and inaccurate results. Carboxylic acids, when present, are titrated together with the phenols, but these may be separately estimated by differential titration in either acetone or acetonitrile, *p*-hydroxyazobenzene being used as indicator. Three procedures are described fully; their precision ranges from ±0·3% to ±0·6%. Water and alcohol, if present in small amounts, do not interfere (though their use is to be avoided in the determination), but chlorinated hydrocarbons cause fading end-points and very high results. J. W. D.

Column Chromatography to identify Colouring Matter in Foodstuffs. G. Jakoliv and G. Colpé. *Ann. Fals. et Fraudes*, **45**, 354–368 (1952): *Chem. Abs.*, **47**, 1301 (10 Feb. 1953).

The sample is extracted with an equal weight of water. Beverages containing alcohol are first freed from the latter by evaporation. An extract prepared with *iso*amyl alcohol is given on a column of Al_2O_3 5 mm. in diameter and 20–25 cm. high. As eluents (10 c.c. each, 24 hr.) the following are used— water, 5% ammonia, N-NaOH, 0·1 N-HCl, followed by 3 c.c. of N-NaOH, CH_3OH,

5% $BaCl_2$, $NaHSO_3$. The chromatograms of a large number of permitted and prohibited colouring materials are described. C. O. C.

Fluorescence Test for the *o*-Hydroxycarbonyl Group in Aromatic Compounds. N. A. Raju and K. Neelakantam. *Current Sci.* (India), **20**, 322–331 (1951): *Chem. Abs.*, **47**, 970 (10 Feb. 1953).

Intense fluorescence under ultraviolet radiation is shown when the following 1-acyl-2-naphthols are treated with boric acid in conc. H_2SO_4: $C_3H_5{\cdot}CO$, $C_3H_7{\cdot}CO$, $CH_2{\cdot}CH(CH_3){\cdot}CO$, $C_4H_9{\cdot}CO$, lauroyl, myristoyl, octanoyl, and decanoyl. C. O. C.

Quantitative Separation of Fibre Mixtures by Flotation. S. H. Mhatre and G. P. Tawde. *J. Textile Inst.*, **44**, T 70–T 75 (Feb. 1953).

Apparatus is described in which fibre mixtures are separated by differential flotation and which permits simple removal of the different layers. Results obtained are compared with those from other methods, and it is shown that a closer agreement is found with mixtures which are also separable by manual dissection. Satisfactory separation is attained with viscose rayon–cotton mixtures, and the method can also be applied to jute–cotton blends, for which no method has hitherto been described. J. W. B.

Effect of Wiley Mill Cutting on Solubility of Cellulose Fibres. A. F. Johnson and W. A. Mueller. *Ind. Eng. Chem.*, **45**, 215–217 (Jan. 1953).

Fibres were cut in a Wiley mill to destroy their gross structure, and the resulting powder was separated into various particle size ranges by sieving. A linear relationship was found between the solubility in 2·75 N-NaOH at room temp. and the reciprocal of the particle size. Prior physical or chemical treatments can alter both the solubility and the slope of the curve. Thus in attempting to characterise cellulose by solubility measurements, it is essential to determine both the solubility of the fibrous material and the slope of the solubility–(particle size)$^{-1}$ curve. W. K. R.

Analysis of Cellulosic Materials impregnated with Urea–Formaldehyde or Melamine–Formaldehyde Resins. S. Kündig. *Textil-Rund.*, **7**, 451–464 (Oct.), 501–527 (Nov. 1952).

Qualitative and quantitative methods are reviewed and discussed at length, together with those developed by the author. From quant. determinations of formaldehyde and nitrogen (as ammonia) in material hydrolysed with 2N-H_2SO_4 under reflux for 4 hr., the max. and min. amounts of resin which may be present in the original are calc. The result is expressed as the mean ± the deviation. The method can be applied in the presence of dyes provided the amount of nitrogen derived from the dyes is known. Other finishing agents containing nitrogen must be absent. Hydrolysis of melamine–formaldehyde resins by water at 174°C. and pH 6·6 is investigated, but as a method of analysis is much more limited. H. E. N.

Improved Copper Number Determination. J. D. Pelgroms and L. Villers. *Papeterie*, **74**, 87 (1952): *Textil-Rund.*, **8**, 50 (Jan. 1953).

Wenzl's method is not always satisfactory, probably because of variations during heating. The method, fully described, is modified by use of a pressure vessel on a water-bath. Results are compared with those obtained by Wenzl's method. H. E. N.

Identification of Damage to Rayons. E. Kornreich. *Dyer*, **109**, 57–63 (9 Jan. 1953).

Damaged regenerated cellulosic rayons may be identified by observing their behaviour in 30% NaOH under a cover slip. When pressure is applied, chemically tendered fibres either develop longitudinal fissures or break up into segments; adjacent undamaged fibres swell, but return to their original condition on release of pressure. Cellulose acetate presents a more difficult problem because, being intermediate between regenerated and truly synthetic fibres, it can be damaged by a wider range of reagents. Test materials are prepared by damaging cellulose acetate with H_2SO_4, HCl, NaOCl, H_2O_2, and NaOH, and a table is presented showing how the fibres behave in 9% NaOH. Significant differences are further elucidated by staining tests, and results are concisely combined in a table. Anomalous unexplained results are given by delustred fibres. J. W. B.

Simple Technique for investigating the Effect of Humidity on the Fading and Degradation of Dyed Cotton Fabrics. D. Ashton and M. E. Probert. *J. Textile Inst.*, **44**, T 1–T 11 (Jan. 1953).

Dyed fabrics are exposed to daylight in air controlled at any desired R.H., and the effects of humidity on the fading and photochemical activity of a large number of different dyeings on cotton cloth are studied. Fluidity increases during exposure are used as an empirical measure of the photochemical activity of the dye, and curves relating the increase in fluidity to the R.H. are shown for several vat and a few basic dyes. Basic dyes show a steady increase in fluidity rise with increasing R.H.; no similar relationship is found with vats, which mostly are less active at 50% than at 0 or 100% R.H. Concurrent exposures of 46 vat dyeings at 10% and 90% R.H. show great differences in response to humidity, with regard to both fading and photochemical activity. A close correlation is found at a given R.H. between the fading of vat dyes and their sensitising action on photochemical degradation. It is suggested that earlier discrepancies with moderately active dyes are due partly to lack of humidity control. Similar experiments with 38 azoic dyeings show a similar correlation, the greatest activity being shown by those dyes which fade most rapidly. J. W. B.

Activation of Enzymes by Chelating Agents. S. M. Altmann and E. M. Crook. *Nature*, **171**, 76–77 (10 Jan. 1953).

The activating effect of such chelating agents as ethylenediaminetetra-acetic acid and histidine is ascribed to their ability to remove "heavy" metals from the reacting system. C. J. W. H.

Esterification of the Carbohydrates in the Plant Cell Wall with *p*-Phenylazobenzoyl Chloride for Microspectrographic Investigation. S. Asunmaa and P. W. Lange. *Svensk Papperstidning*, **56**, 85–90 (15 Feb. 1953).

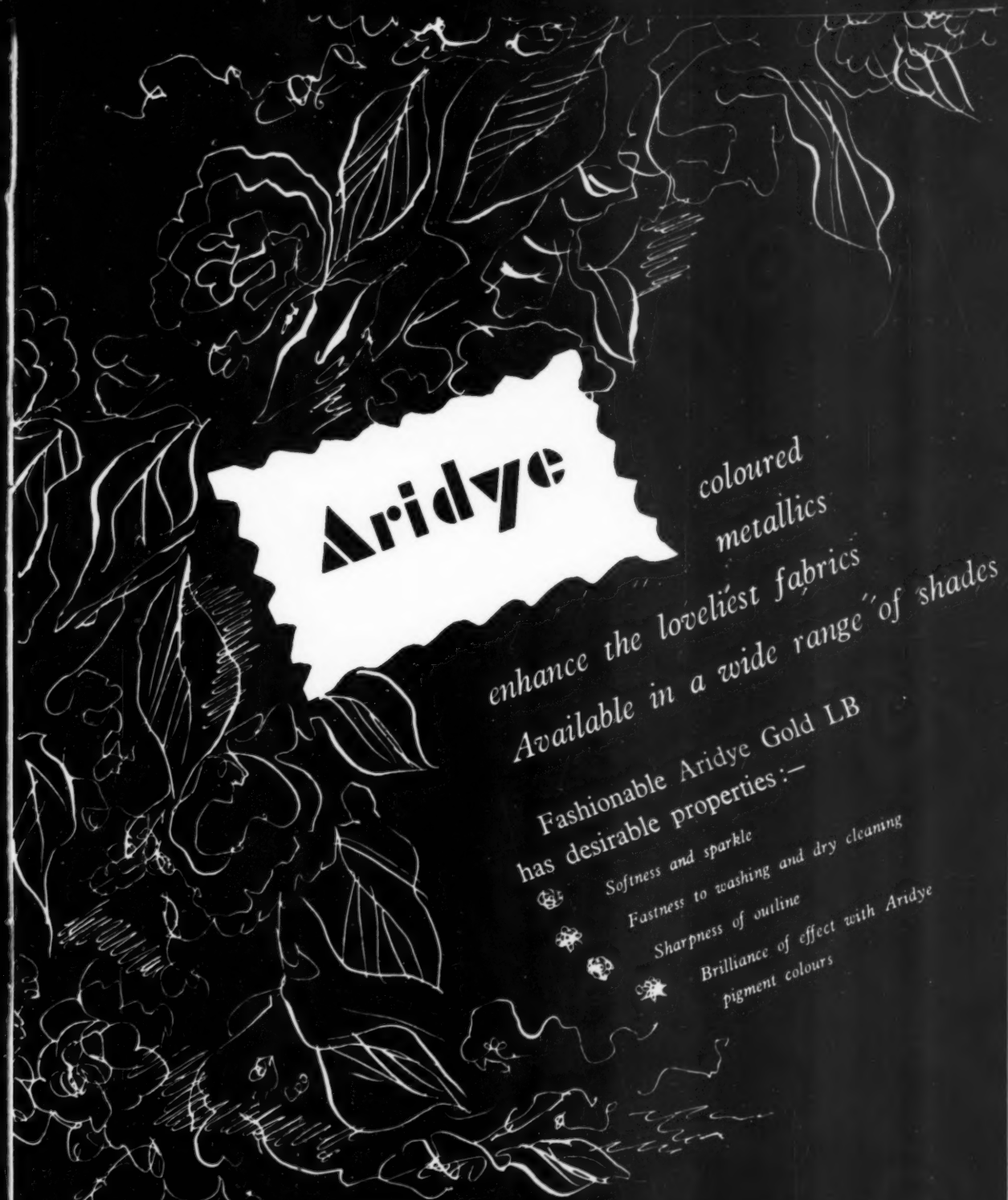
For the microspectrographic study of the carbohydrates in lignin-free plant cell walls, a light-absorbing component must be quantitatively combined with the carbohydrates. This can be done by esterification with *p*-phenylazobenzoyl chloride. The fibre ester structure is very similar in its main features to that of the original fibre, and the general shape of the absorption curves for the esterified fibres is the same as that for the light-absorbing component in solution. The maximum of the light absorption of the fibre ester in comparison with that of the light-absorbing component in solution is shifted only slightly towards longer wavelengths. The influence on the esterification of residual lignin in the cell wall is demonstrated. S. V. S.

PATENT

Wear-testing Machines. Linen Industry Research Assocn. *BP* 686,330

The specimen being tested is mounted over a convex resilient boss and is rubbed by an abradant fabric clamped over a flat base plate from which project several rounded studs. The interaction of these studs with the resiliently mounted specimen results in the production of the effects of simultaneous surface abrasion, flexing, and stressing of the specimen, such as occurs in actual wear. C. O. C.

Alphabetical List of New Products developed since November 1951 (IV p. 165).
Compounds of Curcumin and Boric Acid. I—Structure of Rosocyanin (IV p. 168).
Compounds of Curcumin and Boric Acid. II—Structure of Rubrocurcumin (IV p. 168).
Compounds of Curcumin and Boric Acid. III—Infrared Studies of Rosocyanin and Allied Compounds (IV p. 168).
Electron-microscopic Study of Frictional Abrasion in the Viscose Rayon Spinning Process (VI p. 171).
Reflectance as a Measure of the Soil Content of Cotton Fabric (VII p. 172).
Course of Fibre Degradation during Laundering—I [Cotton] and II [Rayon Staple] (VII p. 172).
Bleached Linen and the Fluidity Test (VII p. 173).
Weather-, Water-, Wash-, and Flame-proof Finish, and the Testing thereof (X p. 176).
Physical Properties of Paper Pulps. I—Elastic Properties of Wet Mats of Papermaking Fibres. II—"Freeness" of Paper Pulps and the Forces of Capillary Water Retention (XI p. 177).



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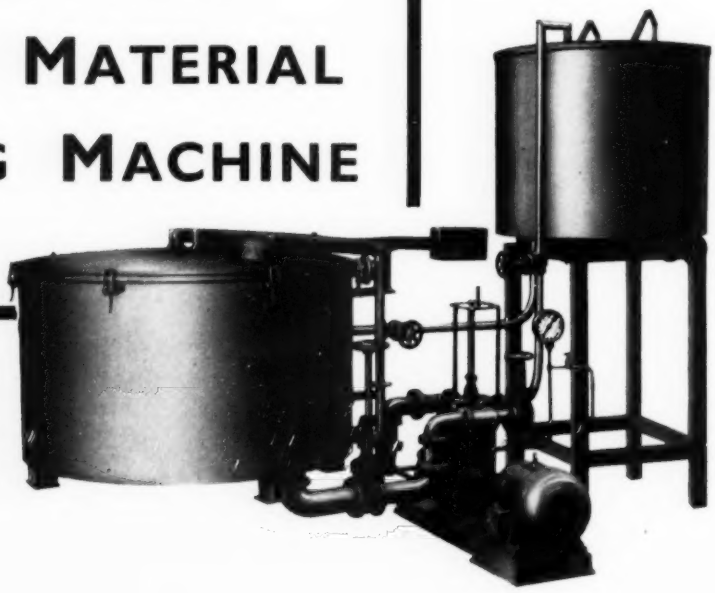

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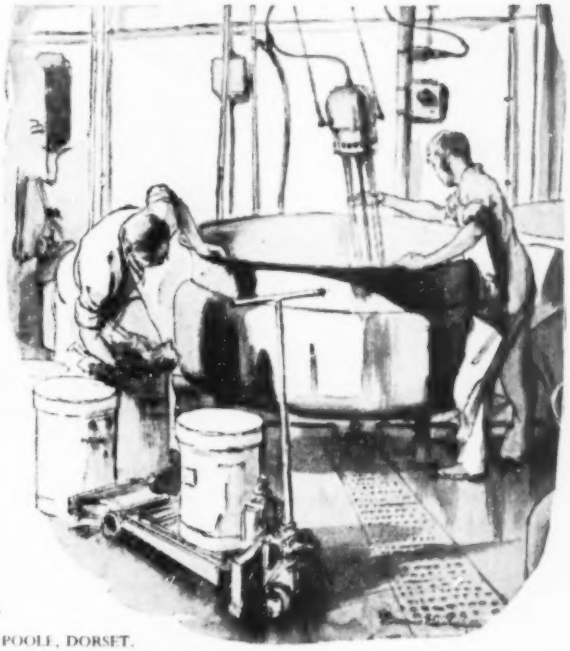

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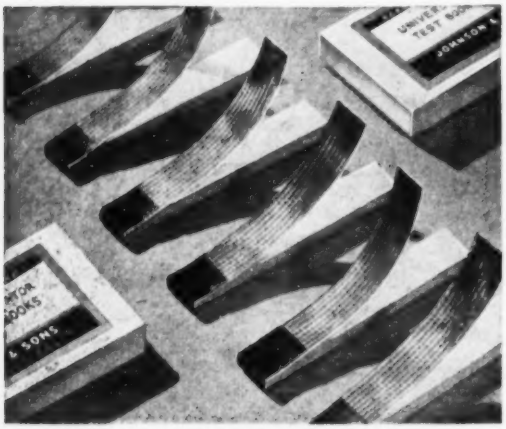

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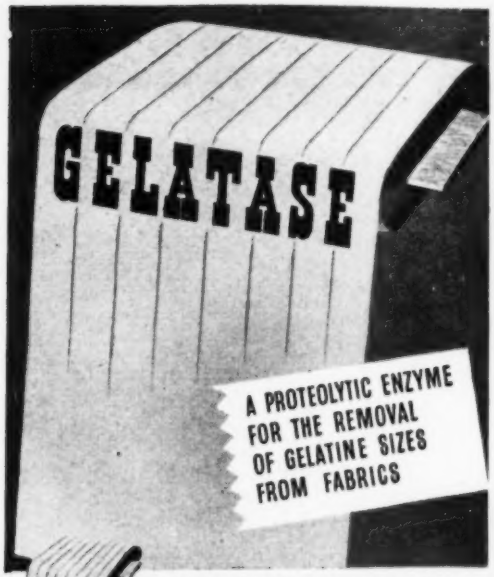

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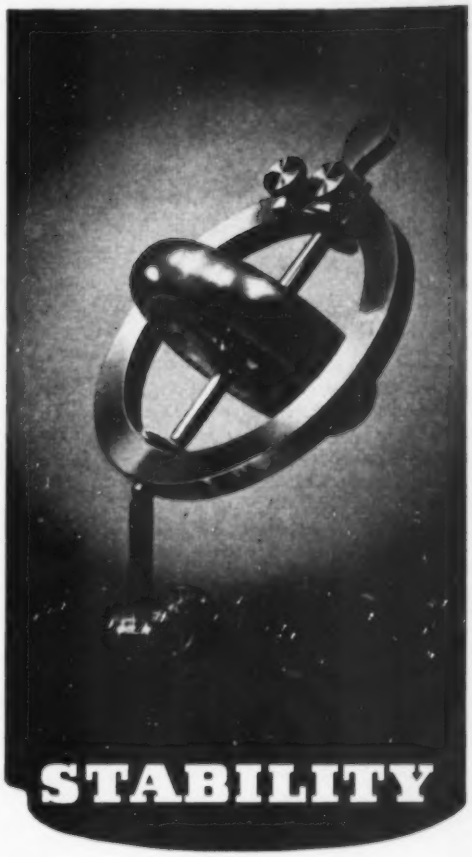

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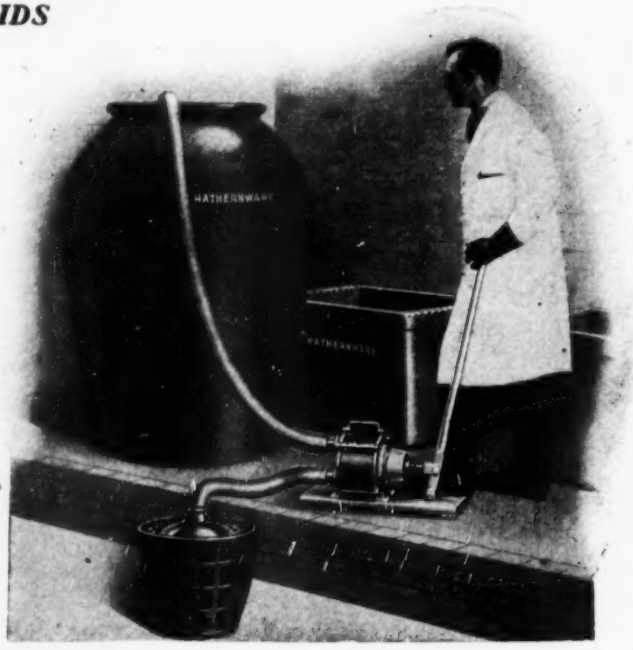

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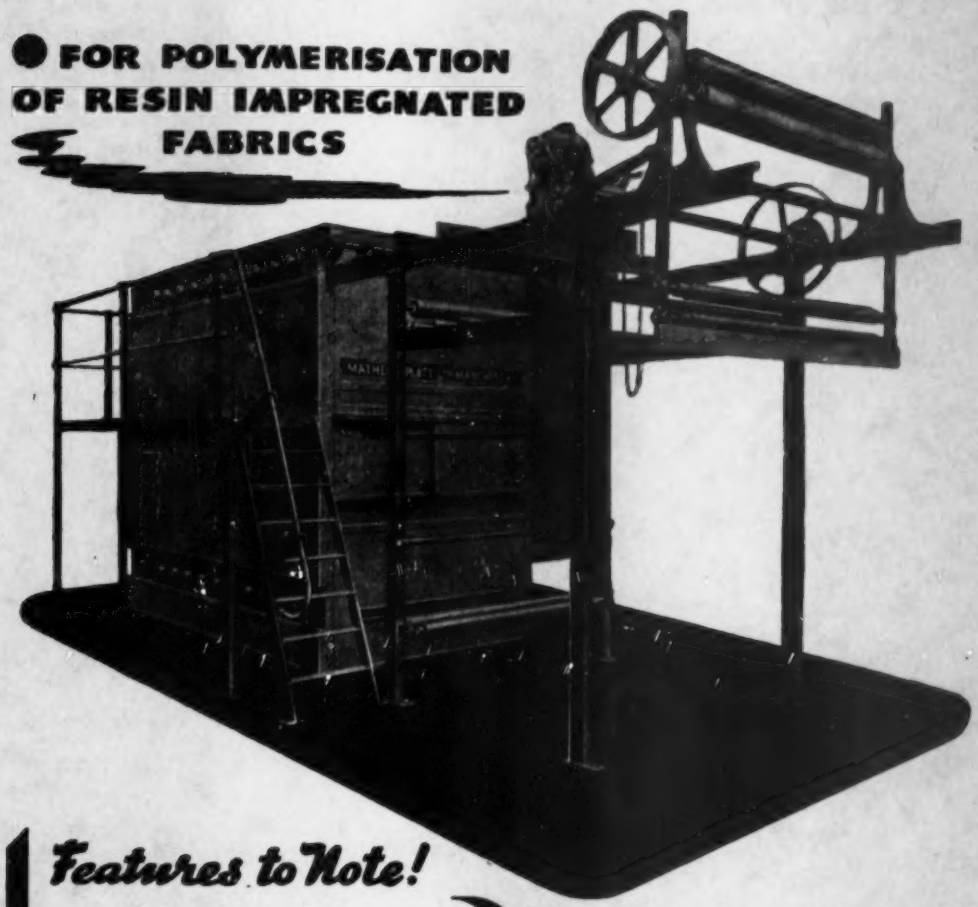

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